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## SAMBUCUS PUBENS VAR. XANTHOCARPA.<sup>1</sup>

BY JAMES J. LYNCH.

The species *Sambucus pubens* was first recognized as distinct from the European *Sambucus racemosa*<sup>2</sup> by Michaux,<sup>3</sup> but Britton<sup>4</sup> identifies it with *Sambucus racemosa* of Europe. The new variety *xanthocarpa* was found by Nieuwland (2) and showed sufficient differences from *Sambucus pubens* and *Sambucus racemosa*, and this will here be considered for study.

### HABIT OF THE SEEDLING.

The young seedlings were grown indoors and seemed to thrive easily under ordinary cultivation. The seeds are ovoid in shape, channelled and have minute transverse linear markings. In the germination of the seed the embryo breaks through the seed coat very close to the scars and primary root and hypocotyl emerge in succession. (Fig. 1). The cotyledons are ovate to spatulate in shape and the petiole is ridged longitudinally on its inner side. The primary root goes down to a length of about one and a half centimeters from a more or less prolonged hypocotyl and is covered by numerous root hairs. Upon further development of the epicotyl there appear two or three simple serrate leaves, broadly ovate to cordate. (Fig. 2.) The formation of stem and the increase of leaf development occurs in usual way of dicotyledons. (Fig. 13.) The later leaves, however, become more and more typically pinnate. The first are trifoliate with small ovate side leaflets and a large apical one. Transition stages are found between simple and compound leaves. The simple

<sup>1</sup> Part of thesis offered as partial requirement for degree of B. S. in Biol.

<sup>2</sup> Linnaeus, C., *Species Plantarum*, 270 (1753).

<sup>3</sup> Michaux, A., *Flora Bor. Americana* I. 181 (1803).

<sup>4</sup> Nieuwland, J. A., *Am. Mid. Nat.* III., 310 (1914).

leaflets have a tendency of unequalization of halves, but especially it is the apical leaflet that is inequilateral.

#### ANATOMY OF THE SEEDLING.

The primary root has a single radial woodbundle that continues partly through the hypocotyl and gives off two branches for the petioles of the cotyledons. The main part continues into the epicotyl and from this collaterals are given to the leaf petioles as soon as they appear. The stele of the hypocotyl in cross section is diarch exarch.

#### PRIMARY ROOT. (Fig. 3).

A cross section of the primary root shows the woodbundle to be radial, diarch and with apparently a continuous strand of xylem (Xy) having phloem on both sides (Ph). The growth of xylem is exarch and the ducts are spiral and annular. The endodermis (En) is regular and clearly differentiated by the size of cells. In shape the cells are in no way different from the surrounding cortex but do not have Casparyan spots, a common peculiarity of this tissue. In very young plants the periblem (CP) is composed of about four layers of cells which increase in size outwards and merge into a series of more or less flattened cells which constitute the hypodermis (Hy). The epiblema (Ep) cells are thick walled on their outer side and are more palisaded in shape than those lying below them.

#### EPICOTYL (Figs. 4, 5, 6.)

The section illustrated in this figure (Fig. 4) is a very young stage and cut close to the root. The stele like that of the root is diarch exarch and the cells of the pith are very irregular in shape. The stele is present in the middle of the pericycle and this has an endodermis not well defined. The cortical parenchyma of about four layers shows an irregular structure in the size of its cells. A distinctive hypodermis is lacking altogether and the outer layer (Ep) consists of smaller thicker cells than the underlying parenchyma.

A cross section of an older seedling (Fig. 5) shows the changes which occur in the hypocotyl due to later growth. The proto- and meta-phloem (Ph) have been pushed out by the formation of cambium (Ca) which now surrounds the xylem (Xy) and is itself enclosed by the secondary phloem. The development of xylem is irregular and lateral to the proto- and meta-phloem.

The endodermis (En) is quite regular and clearly distinct from the cortical cells around it. The cortical parenchyma cells are round in outline of cross section and the hypodermis is very distinct.

A cross section of the hypocotyl (Fig. 6) shows the stele nearly filled with xylem (Xy). The secondary xylem pushes out the cambium (Ca) and this then constitutes four layers of cells. The phloem (Ph) encircles the xylem which completely fills the inner part of the stele, there by showing the absence of pith. The xylem is fully developed. The cross section was made from a point high up the length of the stem.

#### COTYLEDON AND ITS PETIOLE. (Fig. 9).

As a general rule the cotyledon is notched at its apex and has one closed collateral wood bundle with xylem (Xy) to the upper and phloem (Ph) to the lower side. Chlorenchyma is found in the intervening space between the stele and epidermis (Ep). A distinct hypodermis (Hy) is present just below the epidermis. The petiole of the cotyledon is in no way different from that of the leaf, which will be discussed later.

The upper and lower epidermis (Fig. 7) of the cotyledon have about the same structure. The cells are very irregular in shape and the stomata contain chlorophyll grains and are more numerous upon the ventral face than upon the dorsal surface. Intercellular spaces (IS) are found interposed between the cells of the chlorenchyma (Fig. 8).

#### EPICOTYL (Fig. 10).

The epicotyl in early growth soon has about twelve collateral woodbundles, two of which are shown in the illustration. Three layers of cells constituting the cambium (Ca) and very little differentiated from the phloem (Ph) in size and shape, are interposed between the xylem (Xy) and phloem. Wood parenchyma cells are interspersed between the cells of xylem. The pith (Pi) consists of cells of regular outline. The parenchyma (Pa) is composed of cells of irregular size. A hypodermis (Hy) is found beneath the epidermis (Ep) which apparently consists of two layers, the outer layer of which is not very much thickened as is usually the case.

#### PETIOLE OF THE LEAF. (Fig. 11).

The cross section of the petiole of the leaf is circular in out-

line and has three closed collateral woodbundles. The xylem (Xy) is inward and the phloem (Ph) outward. Cortical parenchyma occupies the intervening space between the stele and the epidermis and a distinctive hypodermis (Hy) does not exist. The epidermis (Ep) is composed of cells longer than broad with a thickened cuticle.

#### THE LEAF. (Fig. 12).

The epidermis of the leaf, dorsal as well as ventral is composed of cells not unlike those of the cotyledon and in general has the same appearance. The cells are flattened and diminish in chlorophyll content towards the outside. There are large intercellular spaces between the chlorenchyma cells. The epidermis (Ep) shows a greater thickening in its walls than in those of the adjoining cells.

#### CONCLUSION.

1. Pith is absent in the primary root and hypocotyl of the young seedling, but is present in the upper part of the hypocotyl and epicotyl.
2. The plant at first produces simple leaves but by a series of transitional stages compound leaves are formed, the apical leaf being the largest.
3. As the lower part of the hypocotyl matures the entire center of the stele is filled with xylem and no pith is to be found.

#### EXPLANATION OF THE FIGURES.

Fig. 1. Seedling showing the emergence of root, hypocotyl, and cotyledons from the seed.

Fig. 2. A more advanced stage of the seedling showing the cotyledons, hypocotyl, root and two young leaves.

Fig. 3. Cross section of the primary root. (Ep) Epidermis, (Hy) Hypocotyl, (CP) Fundamental parenchyma, (En) Endodermis, (Pi) Pith, (Xy) Xylem (Hadrome), (Ph) Phloem (Leptome).

Fig. 4. Cross section of a very young hypocotyl. (Ep) Epidermis, (CP) Cortical parenchyma, (En) Endodermis, (Xy) Xylem, (Pe) Pericycle, (Ph) Phloem.

Fig. 5. Cross section of hypocotyl. More advanced stage than the preceding. (Ep) Epidermis, (Hy) Hypodermis, (Pa) Extrastelar Parenchyma, (En) Endodermis, (Ph) Phloem, (Ca) Cambian, (Xy) Xylem.

Fig. 6. Cross section of hypocotyl, showing still further development. Wood bundle alone is illustrated. (Pa) Parenchyma, (Ca) Cambium, (Xy) Xylem, (Ph) Phloem.

Fig. 7. Surface view of ventral epidermis of cotyledon. Illustration



shows stomata with companion cells and the adjoining cells of the epidermis.

Fig. 8. Section of chlorenchyma in cotyledon. (IS) Intercellular space. (CI) Chlorenchyma proper.

Fig. 9. Cross section of a cotyledon. (Ep) Upper epidermis, (EP) Lower epidermis, (Hy) Hypodermis, (CI) Chlorenchyma, (Xy) Xylem, (Ph) Phloem.

Fig. 10. Cross section of epicotyl. (Ep) Epidermis, (Hy) Hypodermis, (Pa) Parenchyma, (Ph) Phloem, (Ca) Cambian layer, (Xy) Xylem, (Pi) Pith.

Fig. 11. Cross section of the petiole of one of the first leaves. (Ep) Epidermis, (Hy) Hypodermis, (Pa) Parenchyma, (Xy) Xylem, (Ph) Phloem.

Fig. 12. Cross section of an early leaf. (Ep) Upper epidermis, (EP) Lower Epidermis, (CI) Chlorenchyma, (IS) Intercellular Space, (St) Stoma, (Xy) Xylem, (Ph) Phloem.

Fig. 13. An advanced stage of seedling growth.

### THE NAIADES OF MISSOURI.—III.

BY WILLIAM I. UTTERBACK.

#### *Rotundaria granifera* (Lea).

("Purple Warty Back," "Purple Pit.")

Pl. XIX, Figs. 55 A and B.

1838—*Unio graniferus* Lea, Tr. Am. Phil. Soc., VI, p. 69, Pl. XIX, fig. 60.

1900b—*Quadrula granifera* (Lea) Simpson, Proc. U. S. Nat. Mus., XXII, p. 795.

#### ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Identical with those of *R. tuberculata* in all respects.

REPRODUCTIVE STRUCTURES:—Typical specimens from the Mississippi show the outer gills marsupial; conglutinates same color and form as those of *R. tuberculata*; glochidium measures 0.290 x 0.350mm., being a little larger with more of an undulated hinge line, but with the same general form.

#### SHELL CHARACTERS

EXTERNAL STRUCTURES:—Like *R. tuberculata* except smaller rotund, upright, alated, inflated,—especially fuller, higher, more antero-protruding beaks and with more of a rayed character of epidermis on anterior umbonal slope. Interior of shell identical

except perhaps shorter laterals arranged at right angles to the interdentum.

Sex	Length	Height	Diameter	Locality
♂	57 x	57 x	40 mm	(Miss. R., LaGrange)
♀	56 x	56 x	34 "	( " " " )
♂	46 x	46 x	30 "	( " " " )
♀	23 x	21 x	10.5 "	(White " Hollister)

The latter measurement is of a juveniles from a lot identified by Mr. Frierson as approaching *granifera* although would perhaps fall more under *tuberculata*. However, it meets the test of *granifera* in length and height being about equal and in prominent beaks. Its beak sculpture consists of numerous, fine concentric corrugations extending out on disk somewhat like *Q. quadrula*. In general shape of shell and disposition of tubercles it is also like the latter in this adolescent stage.

MISCELLANEOUS REMARKS:—According to shell measurement, and with an allowance for eroded beaks, the Osage forms may be more classed under *granifera*. A divergence of equality for length and altitude may indicate and approach to the *tuberculata*, Lea's type, when diameter may be reduced to unity, it measures length and height the same. On this same basis so many of the *Rotundariae* of South Missouri would approach more nearly to the *granifera* type. Because of its full, projecting beaks, uprightness of shell and disk sculpture this species has sometimes been confused with *Q. pustulosa* and *P. cooperianus*. However, distinction can be easily made by comparing to the rich purple nacre of *granifera*—a color that is not possessed by either *pustulosa* or *cooperianus*. Its breeding season is found to be the same as that of *tuberculata*. Despite their identity of breeding habits, of reproductive and nutritive structures and of internal shell characters there may be sufficient evidence of difference in external shell structures to make *granifera* a good species and thus take it out of its class as a subspecies of *tuberculata*, as Simpson had treated it, and elevate it as Mr. Walker considers.

#### Genus *Plethobasus* Simpson.

1900b—*Plethobasus* Simpson, Proc. U. S. Nat. Mus., XXII, p. 764 (As section).

1912b—*Plethobasus* (Simpson) Ortmann, An. Car. Mus., VIII, pp. 259-260.

(Type, *Unio aesopus* Greene).

ANIMAL CHARACTERS:—Anal separated from supra-anal

opening by short mantle connection; gills long, wide anteriorly, inner laminae of inner gills free from visceral mass; palpi short and wide; only outer gills marsupial, when gravid the ovisacs distend but little, giving the conglutinates a lanceolate shape; conglutinates white, discharged whole; glochidium small, spineless, subovate or slightly oblique; soft parts orange or sulphur color.

**SHELL CHARACTERS:**—Shell elongated to ovate; beaks moderately high, sculptured by obscurely concentric ridges, not extending out on disk; epidermis brown to yellow, usually rayless; beak cavities moderately deep; hinge well formed; nacre white to pinkish.

As to shell characters this genus resembles both those of *Quadrula*—particularly those of the *pustulosa* group—and also the genus *Rotundaria*. Its marsupial characters show an advance over the genus immediately preceeding. The bright coloration of its nutritive soft parts and of its ova would suggest some affinity with the *Fusconaia*. Dr. Ortmann points out this genus as a connecting link between the more primitive *Unioninae* and those of the type of the genus *Pleurobema* and thus elevated Simpson's section, *Plethobasus*, to generic rank, since Simpson recognized special characters of the type, *aesopus*, in shallow beak cavities and outer gills only as marsupial. This genus is represented in this state by *aesopus*, but doubtfully by *cooperianus*.

***Plethobasus cooperianus* (Lea).**

("Cumberland Pig-toe," "Warty Pig-toe.")

*Pl. XX, Figs. 57 A. and B.*

1834—*Unio cooperianus* Lea, Tr. Am. Phil. Soc., V., p. 61, pl. VIII, fig. 21.

**ANIMAL CHARACTERS.**

**NUTRITIVE STRUCTURES:**—Branchial opening densely papillose; anal and supra-anal separated by short (even deciduous) connection; gills rather short, inner gills wider, its laminae free from visceral mass; color of soft parts bright orange yellow, for most part.

**REPRODUCTIVE STRUCTURES:**—Marsupia only occupy outer gills; when gravid swell moderately in center leaving ventral edges sharpened; no glochidia found yet; its ova bright yellow, giving the marsupia a sulphur color.

## SHELL CHARACTERS.

EXTERNAL STRUCTURES:—Shell orbicular, to egg-shape in general outline, disk tuberculated and transversely nodulous between beaks and ventral margin in front of post-umbonal ridge; latter flattened, dorsal ridge low, faintly costated; beaks low, well placed anteriorly; epidermis light-brown to yellowish, somewhat glossy.

INTERNAL STRUCTURES:—Cardinals tripartite in left valve, rather single in right; interdentum broad, rather doubly gashed in right valve; laterals double in left and single in right valve; mantle line high up from ventral margin; nacre whitish, pinkish (or even bluish) within the mantle line, usually lighter color on extra-mantle line border.

Sex	Length	Height	Diameter	Locality
♂	60	x 55	x 32	(Gasconade R., Gascondy)
♀	77	x 62	x 41	(Osage R., Monegaw Springs)
♂	70	x 64	x 40	( " " Warsaw)

MISCELLANEOUS REMARKS:—As this state is out of geographic range of typical *cooperianus* it is natural that no real type may be found in Missouri. However, the writer upon finding a few shells of the *tuberculata* (Raf.) type with white and pink nacre submitted one of the latter to Mr. Walker for his consideration. His comments are:—"A very curious and interesting shell. It has the shape of *Quadrula tuberculata* (Raf.) but the nacre of *cooperiana* (Lea) and I should call it that, although out of range. I never heard of *tuberculata* except with purple nacre." A white naced shell of the same form is considered by Prof. Clark as "rather plump, approaching *granifera*" but that the nacre "suggests *cooperiana*." Other Missouri collectors have commented upon this strange departure of *R. tuberculata* and *granifera* from type. However, if it may be proved that this difference of nacre-color is merely a "fading out" due to chemical reaction of mineral water there would be instead of a true *cooperianus* in this state a mere local form of a *Rotundaria*. The real home of this species is in the Tennessee-Cumberland system where Wilson and Clark (1914, pp. 44 and 60) have found it as a summer breeder (a tachytictic species).

**Plethobasus aesopus** (Green).<sup>1</sup>

("Bull Head," "Sheep's Nose," "Clear Profit.")

Pl. XX, Figs. 56 A and B.

1827—*Unio aesopus* Green, Cont. Mac. Lyceum, I, p. 46, fig. 3.1834—*Unio cyphia* Conrad, New F. W. Shells, p. 68.1900b—*Pleurobema aesopus* Simpson, Proc. U. S. Nat. Mus., p. 764.1912b—*Plethobasus aesopus* (Green) Ortmann, An. Car. Mus., VIII, pp. 260-261.

## ANIMAL CHARACTERS.

**NUTRITIVE STRUCTURES:**—Branchial opening densely set with long and short papillae; anal smooth; supra-anal connected to anal by short mantle attachment; gills long and sharply pointed posteriorly, inner gills wider in front, inner laminae free from visceral mass; palpi short, wide; color of soft parts, peculiar, mostly orange, the foot, adductors and mantle margins being a brighter orange.

**REPRODUCTIVE STRUCTURES:**—Only outer gills marsupial; ovisacs, when gravid, swell moderately in the center leaving their unswollen distal ends pointed, thus giving their conglomerates narrow, lanceolate shape which are solid, red and discharged in unbroken form; glochidia semicircular, ventral margin obliquely rounded, hinge line long, medium in size, length slightly greater than height (0.220 x 0.200mm).

## SHELL CHARACTERS.

**EXTERNAL STRUCTURES:**—Shell triangular, rounder before, pointed behind, rather heavy; post-umbonal ridge rounded; umbones high and full, tilted anteriorly, incurved, sculptured by a deep furrow just posterior to tip of each beak and by a few coarse concentric ridges and fine radiating lines; disk sculptured by a row of six or eight, coarse, elongated, undulated or hummocky tubercles extending from beaks to ventral margin with a broad, shallow trough between this tubercled row and the post-ridge; epidermis dark straw to glistening yellowish brown.

**INTERNAL STRUCTURES:**—Cardinals double in left, single in right; interdentum narrow; laterals double in left only faintly

<sup>1</sup> According to Rafinesque's evident description of Green's *aesopus* in his Monograph of 1820 (p. 39) under the name of *Obliquaria cyphia* (*U. cyphia*) this species should really bear the name now of *Plethobasus cyphius* (Raf.) because of priority.

double in right; umbonal cavity moderately deep; nacre pearly white, iridescent.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	87	x 70	x 47	—	0.170 (Miss. R., Hannibal)
♂	63	x 45	x 34	—	0.230 (Des Moines R., Dumas)
♀	55	x 40	x 32	—	00.180 (Little Blue, Courtney)
♂	33	x 22	x 20	—	0.210 (Des Moines R., Dumas)

This last measurement of a young shell shows great inflation comparatively (See *Figs. 56 C and D.*)

MISCELLANEOUS REMARKS:—This species has a general distribution over the Ohio-Cumberland system. It is not uncommon in the Mississippi and Des Moines Rivers, but has only been found in one interior stream, the Little Blue, Kansas City, where it was collected by Mr. Bush and donated to the U. S. National Museum under No. 134,642. Some have found all four gills of *aesopus* marsupial, but most observations seem to prove that only the outer are used as marsupia. The writer has only observed outer gills as marsupial—even in case of many individuals with sterile gills. He is able to verify Dr. Ortmann's observation of charged marsupia with the "lilac hue." Its accidental host has been found to be "sauger" (*S. canadense*).

#### Genus *Pleurobema* Rafinesque.

1820—*Pleurobema* Rafinesque, Monograph of Bivalve Shells of River Ohio, Ann. Gen. Sci. Phys. Brux., p. 313.

1900b—*Pleurobema* (Raf.) Simpson, Proc. U. S. Nat. Mus., XXII, p. 745 (amended).

(Type, *Unio clava* Lamarck.)

ANIMAL CHARACTERS:—Anal opening with short mantle connection to supra-anal; inner gills much longer, inner laminae free from visceral mass; palpi small very pointed; only outer gills marsupial; ovisacs distend but little when gravid; conglutinates white, narrowly leaf-like or lanceolate, not broken; glochidium small, spineless, subovate.

SHELL CHARACTERS:—Shell subtrapezoidal, subquadrate, rounded or elongated, upright, or, when oblique, with beaks produced anteriorly; beaks usually rather full and high, sculptured obscurely with concentric ridges not extending out on the disk; disk without sculpture; epidermis olivaceous, reddish brown or even black, rays more or less present in umbonal region; hinge

teeth well developed; umbonal cavities moderately deep; nacre generally whitish or red.

MISCELLANEOUS REMARKS:—The above descriptions of the anatomy shows the genus to be identical to that of the genus *Plethobasus*; but in shell characters there is much difference. It may well be stated in general terms that *Pleurobema* resembles *Quadrula* as to its nutritive soft parts and *Fusconaia* as to external shell structures. However, the *Pleurobema* shell does not usually possess such a prominent, angular, and inflated umbonal ridge as that of the *Fusconaia*; neither does it possess the yellowish color of the nutritive anatomy as in the case of *Fusconaia*. However, the differences among the species of *Pleurobema* are well marked ecological, as well as morphological, ones; i. e., the heavier, more inflated forms being more as dwellers in the large rivers, and the smaller, more compressed shells being found in the creeks and medium sized rivers. From the two following genera *Pleurobema* may be easily distinguished by not possessing such an elongate and straight type of shell.

The author of this catalogue wishes to gratefully acknowledge the dedication of a new species of *Pleurobema* to him under the authorship of Mr. Frierson. The description and figures of this new species (*Pleu. Utterbackii* F.) appear here for the first time, and, until more data can be secured, concerning its soft parts in gravid condition, it is placed here tentatively at the close of the list of *Pleurobema*.

***Pleurobema obliquum* (Lamarck).**

("Pig-toe," "White Pig-toe," "Ohio River Pig-toe.")

*Not figured.*

1819—*Unio obliqua* Lamarck, An. Sans. Vert., VI, p. 72.

1900b—*Quadrula obliqua* Simpson, Proc. U. S. Nat. Mus., XXII, p. 788.

1912b—*Pleurobema obliquum*, (Lamarck) Ortmann, An. Car. Mus., VIII, p. 264.

ANIMAL CHARACTERS:—The soft part of typical *obliquum* not having been seen by the author, reference is made to the descriptions of the varieties of this species—the anatomy of which is, of course, identical. Wilson and Clark (1914, p. 61) report this species as occasionally bearing ova in all four gills and that the conglutinates have the appearance of cucumber seeds.

SHELL CHARACTERS:—Shell trigonal, medium in size, emargi-



nated post-ventrad with radial furrow in front of flattened post-umbonal ridge; beaks swollen, protruding anteriorly, sculptured by concentric ridges; epidermis reddish brown to black with rays originating in umbonal region; cardinals heavy, double in left single in right valve; laterals double in left, more or less double in right valve; nacre white.

MISCELLANEOUS REMARKS:—The writer has been unable to find *Pleu. obliquum* in typical form anywhere in the state and claim is only made for it through its various forms and through Simpson's report, that it is found in the Mississippi above the mouth of the Missouri River. Surely there is much need of research chiefly with regard to the geographic facts relating to the distribution of this species. Most students of geographic distribution concur in the belief that no true *obliquum* is found west of the Mississippi and that it is rarely seen north of the Ohio. Its metropolis is that richest of all centers of mussel faunae, the Cumberland River, where Wilson and Clark report it as the most abundant of all the numerous species found there. Briefly stated, *obliquum* occurs in this state, but with its characteristic radial furrow obliterated and its intergrading forms are very numerous running into each other in every puzzling way.

***Pleurobema obliquum plenum* (Lea).**

*Not figured.*

1840—*Unio plenus* Lea, Tr. Am. Phil. Soc., I, p. 286; Tr. Am. Phil. Soc., VIII, 1843, p. 211, pl. XIV, fig. 26.

1900b—*Quadrula plena* Simpson, Proc. U. S. Nat. Mus., p. 790.

The writer has not found this species in this state and no description appears here, since neither soft parts nor shells have been seen. However, *plenum* is listed as a variety for Missouri through the kind report of Mr. Walker that he has it from the James River, near Springfield, and that it bears the same relation to *obliquum* as does also a variety of *coccineum* found in the same locality.

***Pleurobema obliquum pyramidatum* (Lea).**

("Pig-toe," "Pyramid Pig-toe.")

Pl. XX, Figs. 58 A and B.

1834—*Unio pyramidatus* Lea, Tr. Am. Phil. Soc., IV, p. 109, pl. XVI, fig. 39.

1900b—*Quadrula pyramidata* Simpson, Proc. U. S. Nat. Mus., XXII, p. 790.

1912b—*Pleurobema pyramidatum* (Lea) Ortmann, An. Car. Mus., VIII, p. 264.

#### ANIMAL CHARACTERS.

**NUTRITIVE STRUCTURES.**—Branchial opening densely papillose; anal finely papillose; anal and supra-anal very closely connected by mantle edges—sometimes connection deciduous;—inner gills broader, longer, inner laminae free from visceral mass; palpi long and thickened; most of soft parts dirty white, mantle edges at branchial openings black.

**REPRODUCTIVE STRUCTURES.**—Only outer gills marsupial; sterile marsupia with crowded septa, those of male gills very distinct and more separated; no gravid specimens found.

#### SHELL CHARACTERS.

**EXTERNAL STRUCTURES.**—Shell obliquely pyramidal or trap-ezoidal, very solid and heavy anteriorly; disk smooth; beaks very full and projecting anteriorly; rather straight dorsad, greatly curved ventrad, epidermis black.

**INTERNAL STRUCTURES.**—Cardinals single in right, double in left valve; laterals double in left, single in right; scars deeply impressed; beak cavities moderately deep; nacre white, tinged with blue posteriorly—sometimes pinkish.

Sex	Length	Height	Diameter	Locality
♂	65 x	55 x	40mm	(Osage R., Sagrada)
♀	73.5 x	52.5 x	42 "	( " " Warsaw)
♀	63.5 x	54 x	39 "	(Meramec R., Fern Glen)
♂	27.5 x	26.5 x	19.5mm	(Osage R., Baker)

Juvenile shell thick, almost globular, very smooth; beaks full but not protruding anteriorly, sculptured with two or three ridges arranged rather concentrically and breaking into three coarse tubercles at base of post-umbonal ridge; epidermis reddish and leather-like with rays on the anterior half of shell; lateral teeth more inclined to double in right valve than in mature shell; beak cavities very shallow; nacre solid pink.

**MISCELLANEOUS REMARKS.**—This *pyramidatum* is the same as found in Arkansas and Oklahoma where it is also found unassociated with typical *obliquum*. The species, *Pleu. pyramidatum* (Lea) and *obliquum* (Lam.) are most typically represented in the Tennessee-Cumberland system and the fact of their forms turning up in the South West (i. e., in the region south of the Missouri and

west of the Mississippi Rivers) is a question worthy of investigation. This heavy, oblique shell is very easy to identify and cannot be very well confused with other *Pleurobema*. It has been defined as "an overgrown *Pleu. clava*."

***Pleurobema obliquum catillus* (Conrad).**

("Round Pig-toe," "Pink Pig-toe," "Osage Nigger-Head.")

*Pl. XX, Figs. 62 A and B.*

1836—*Unio catillus* Conrad, Monog. III, p. 30, pl. XIII, fig. 2.

1838—*Unio solidus* Lea, Tr. Am. Phil. Soc., VI, Pl. V, fig. 13.

**ANIMAL CHARACTERS.**

**NUTRITIVE STRUCTURES:**—Brachial opening rather large, with many papillae; anal smooth, separated from supra-anal by very short mantle connection; gills short and wide, inner the wider, its inner laminae free from visceral mass; palpi short, wide pointed; color of soft parts mostly dingy white.

**REPRODUCTIVE STRUCTURES:**—Outer gills only maruspiial, when gravid brownish, slightly swollen longi-centrad leaving ventral edges tapering somewhat obtusely; conglutinates white, formed like seeds of an immature cucumber; glochidium intermediate for *catillus* and *obliquum* as to general form, but larger than either, averaging 0.170 x 0.180mm.

**SHELL CHARACTERS.**

**EXTERNAL STRUCTURES:**—Shell trapezoidal to subovate, subglobose, thick, heavy, medium in size, rounded before, obtusely rounded behind; disk smooth no radial furrow; beaks high, full, sculptured by obscure concentric lines; epidermis of red-leather color, rayed anteriorly.

**INTERNAL STRUCTURES:**—Cardinals single in right, roughly double in left; laterals single in right, double in left valve; scars deeply impressed; beak cavities rather deep; nacre solid pink, rarely white.

Sex	Length	Height	Diameter	Locality
♂	57.5	x 41	x 33.6mm	(Marais des Cygnes R., Rich Hill)
♀	59	x 42	x 34.5 "	( " " " " " " )
♂	45	x 44	x 30.0 "	(Osage R., Bagnell)
♀	27	x 26	x 21.5 "	( " " Baker)

This last measurement shows this juvenile to be sub-globular. Its shell is unusually thick with very shallow beak and branchial

cavities; hinge teeth usually flattened, very wide and heavy; nacre bright pink; epidermis leathery-red with rays on anterior part of shell ...

MISCELLANEOUS REMARKS:—This form of *catillus* is the most common of the *Pleurobema*e in the Osage-Gasconade system and is not found any where else in the state. This "*solida*" variety is characteristic for its small, solid, subglobular shell, with a more rounded posterior end and less compression for the posterior half than in typical *catillus*. The radial furrow of the type species (*obliquum*) is entirely lost. The only difference between this form in the two basins (that of the Osage and Gasconade) is in that of nacre-color—the Osage never varying from pink and the Gasconade shell always with white-nacre. The almost endless inter-gradations for *obliquum* and *catillus* seem to be the general rule rather than exception, but here in Central Missouri the variety herein described is predominant. Another form occasionally met with in the Osage and grading in between this subspecies and *catillus* is one that comes near to *fulgidus* of Lea, but it would not be listed on account of its rare occurrence and doubt whether it should be really separated from this variety, *obliquum catillus*. Hundreds of individuals of this form were examined daily throughout the entire month of July, when it was in the height of its breeding season, to find it only gravid (without exception) in its outer gills. It is found to be tachytictic. Perhaps the best idea can be obtained, concerning the difference of the Central Missouri *catillus* from that of South Missouri, by comparing two average measurements of mature shells given in the following:

Sex	Length	Height	Diameter	Locality
♂	87	x 64	x 41	(White R., Hollister)—S. Mo.
♂	54	x 44	x 30	(Osage R., Warsaw)—Cen. Mo.

In both the radial furrow of typical *catillus* is effaced. The measurement of the latter removes it so far from the type species that probably a good species might be made out of it.

***Pleurobema obliquum coccineum* (Conrad).**

("Pink Pig-toe," "Round Pig-toe," "Flat Nigger Head.")

Pl. XX, Figs. 61 A, B, C and D.

1836—*Unio coccineus* Conrad, Monog. III, p. 29, Pl. XIII, fig. I.

1839—*Pleurobema obliquum coccineum* (Conrad) Ortmann, Pr. Am. Am. Phil. Soc., LII, pp. 287—390.

## ANIMAL CHARACTERS.

**NUTRITIVE CHARACTERS:**—Branchial opening with two ranks of papillae; anal crowded with fine, short papillae; supra-anal moderately separated from anal; inner gills slightly wider than outer, inner laminae free from visceral mass; palpi thick and long; connected antero-dorsad over half of length; color of soft parts dingy white, for most part.

**REPRODUCTIVE STRUCTURES:**—Only outer gills marsupial: when gravid marsupia cream colored, somewhat padiform; conglutinates white, leaf-like, solid; glochidium medium, subovate spineless, measures 0.150 x 0.155mm.

## SHELL CHARACTERS.

**EXTERNAL STRUCTURES:**—Shell roundly elliptical, thick and solid anteriorly, moderately thin and compressed for posterior half; post umbonal ridge flattened; beaks not prominent, nor protruding anteriorly, sculptured by concentric corrugations; epidermis reddish brown, rayed anteriorly.

**INTERNAL STRUCTURES:**—Cardinals double in both valves; laterals single in right, double in left valve; interdentum wide and thin; beak cavities shallow; nacre rose pink.

Sex	Length	Height	Diameter	Locality
♂	74 x	62 x	34	(Osage R., Warsaw)
♀	64 x	54 x	31	( " " " )
♂	40 x	37 x	22	( " " Baker)

**MISCELLANEOUS REMARKS:**—No juveniles of this form are at hand for description. The writer met with this variety in the Osage. It can be easily distinguished from the more typical *coccineum* of South Missouri in not possessing such compression for the posterior half of shell, in being more elliptical and heavier. The general outline is that of *O. ellipsis*. It can be separated from *Pleu. obliquum catillus* by this elliptical shape, but its greater compression (especially posteriorly) and by its thinner, less solid shell. The writer made an interesting discovery while examining a gravid individual of this form afield with a (X12) lens to find its late embryos in rapid rotary motion around one axis. This phenomenon had been observed by the author in *Lastena ohioensis*. A breeding record of this form shows it to be a summer breeder.

**Pleurobema catillus** (Conrad).

("White Pigtoe," "Pink Pig-toe," "Solid Pig-toe.")

Pl. XX, Figs. 59 A and B.

1836—*Unio catillus* Conrad, Monog. III, p. 30, pl. XIII, fig. 2.

1838—*Unio solidus* Lea, Pr. Am. Phil. Soc., VI, pl. V, fig. 13.

1845—*Unio fulgidus* Lea, Pr. Am. Phil. Soc., p. 164; Tr. Am. Phil. Soc., X, 1848, p. 73, pl. IV, fig. 10.

1900b—*Quadrula solida* Simpson, Pr. U. S. Nat. Mus., XXII, p. 789.

## ANIMAL CHARACTERS.

**NUTRITIVE STRUCTURES:**—Branchial opening densely papillose; anal finely papillose; supra-anal closely connected to anal; gills rather long and wide, the inner being wider and longer, inner laminae free from visceral mass; palpi long and connected about two-thirds of their length anteró-dorsad; soft parts tanned flesh-color, yellowish in front of branchial opening, papillae blackish.

**REPRODUCTIVE STRUCTURES:**—Marsupia only occupying outer gills, ovisacs swollen more centro-lengthwise tapering obtusely at ventral edges; conglutinates leaf-like, compressed white; glochidia semicircular, medium in size, hinge line nearly straight; length and height equal (0.160 x 0.160mm.).

## SHELL CHARACTERS.

**EXTERNAL STRUCTURES:**—Shell subtriangular with obtusely pointed posterior end, very solid and thick through cardinal hinge region, ventral line always more curved than dorsal; disk smooth, post-umbonal ridge flattened; radial furrow in front rather shallow and wide; beaks full, protruding but not beyond anterior end; epidermis reddish brown with decided streaks of green radiating ventrad from umbonal region.

**INTERNAL STRUCTURES:**—Cardinals heavy, double in both valves; laterals double in right, single in left valve; interdentum broad, short and thick; umbonal cavities shallow; nacre salmon to rosy pink.

Sex	Length	Height	Diameter	Locality
♂	82	x 65	x 41	(White R., Hollister)
♀	83	x 64	x 40	(Black R., Williamsville)
♂	80	x 63	x 40	(White R., Hollister)

**MISCELLANEOUS REMARKS:**—Conrad's *catillus* (described as separate from *coccineus* by the author, but united by Simpson) is

the *solidus* of Lea and (in the conventional sense) may be called *Pleu. solidum*. The latter being antedated, we must use the former name. This species is rather typically represented in the Mississippi for Missouri, the mountain streams of South Missouri and also in the Neosho basin of South West Missouri. No real types are ever found in Central Missouri and not even forms are found in North Missouri. This species is distinguished from *Pleu. coccineum* by always being rather swollen and having a radial furrow more or less expressed. In this latter character it never reaches the extreme, as seen in *obliquum*, of the pinched radial groove terminating in sulcus at the post-ventral margin. Its breeding record shows it to be tachytictic.

***Pleurobema coccineum* (Conrad).**

("Flat Nigger-Head," "Pink Pig-toe," "Round Pig-toe.")  
*Pl. III, Fig. 60b; Pl. XX, Fig. 60 A and B.*

1836—*Unio coccineus* Conrad, Monog., III, p. 29, pl. XIII, fig. I.

1900b—*Quadrula coccinea* Simpson, Proc. U. S. Nat. Mus., XXII, pp. 788-789.

1912b—*Pleurobema coccineum* (Conrad) Ortmann, An. Car. Mus., VIII, p. 263.

ANIMAL CHARACTERS.

NUTRITIVE STRUCTURES:—Branchial opening densely set with papillae; anal with indistinct crenulations and papillae; mantle connection between anal and supra-anal very close; gills wide, the inner wider and longer, inner laminae free from visceral mass; palpi long, united two-thirds of their length; color of soft parts tannish, mantle edge at siphonal openings black.

REPRODUCTIVE STRUCTURES:—Only outer gills marsupial; when gravid marsupia swell moderately lengthwise in the center; conglutinates white, thin, leaf-shape, discharged whole; glochidia, suboval, spineless, medium in size measure 0.150 x 0.150mm.

SHELL CHARACTERS

EXTERNAL STRUCTURES:—Shell subelliptical to subquadrate varying with age, flat, very much compressed through post half, greatly inflated (comparatively) anteriorly, dorsal and ventral margins curved about the same; beaks rather full not very well placed to the front, sculptured by concentric lines with two or



three knotty elevations behind; epidermis marked by darker bands parallel to the growth lines, rayed in young.

INTERNAL STRUCTURES:—Cardinals sharply doubled in both valves; interdentum cut away in the left valve to receive the posterior left cardinal; laterals curved, double in left single in right; umbonal cavity moderately deep; nacre salmon pink to white.

Sex	Length	Height	Diameter	Locality
♀	60 x	40 x	24	(White R., Hollister)
♂	75 x	56 x	31	(St. Francis, Greenville)
♀	47 x	40 x	22	(White R., Hollister)

Note that the younger shell is more rounded and squarer, has more of an olivaceous epidermis with green rays; umbonal sculpture plainer with three bumps on base of post-ridge; nacre more pearl bluish.

MISCELLANEOUS REMARKS:—This species (*Pleu. coccineum*) is most typically represented in the South and South-west Missouri drainage systems and, while it is not found at all in North Missouri, it is only represented occasionally by mere forms in Central Missouri. It is usually restricted to the smaller streams or to the headwaters of large rivers. Normally, marsupial characters are limited to the outer gills only, although this fact has been denied by some. The writer on one occasion, found this species with all four gills gravid, but in all other cases the outer gills were only found functioning as marsupia. In this species and in some other *Pleurobema*, there may be some variability in this respect. *Coccineum* has a short breeding season as determined by the writer's breeding record.

#### *Pleurobema missourense* (Marsh).

("Missouri Shell.")

*Not figured.*

1901—*Pleurobema Missouriensis* Marsh, *Nautilus*, XV, pp. 74-75.

#### ANIMAL CHARACTERS.

Not having seen the soft parts of this species the writer can offer no description. Although the author of *missourense* gave no such description, yet the establishment of this species within the genus *Pleurobema* must have been inferred from these characters.

## SHELL CHARACTERS.

Through the kindness of Mr. L. S. Frierson the writer was loaned a shell of this rare species from the original lot, described by Mr. Marsh and collected by Mr. Elwood Pleas in the Black River, Popular Bluff, Butler County, Missouri. From the fact that the writer had but one shell before him, he quotes a more complete description from the author than can be given without a series at hand:—"Shell smooth, obliquely triangular, rounded behind, subbiangular behind, moderately thick, very much thicker anteriorly, sides somewhat flattened, beaks wide, solid, incurved; ligament long, light brown; epidermis light brown, without rays, growth lines numerous, not raised; umbonal slope wide and rather flat; posterior slope wide, flattened with two dark inconspicuous lines running from beaks to posterior margin; beak sculpture unknown; cardinal teeth rather long and solid, depressed, disposed to be double in both valves, corrugate; lateral teeth straight, oblique, corrugate; anterior cicatrices distinct, deep, post cicatrices distinct and well impressed; shell cavity wide and deep; nacre white."

The above description was made from four specimens from young to adult. The young shells are much flatter. The measurement of one of these adult shells is:

Length	Width	Diameter	Locality
66	x 54	x 36mm	(Black R., Popular Bluff)

MISCELLANEOUS REMARKS:—The author of this species states that he knows of no described species which closely resembles it. From the single specimen in hand it seems to be rather intermediate for *P. catillus* and *coccineum*; however, it does not possess the radial furrow of the former nor the rounded and compressed posterior half of the latter. The shell of *missourense* compares well with that of *Fusconaia subrotunda* and if its soft parts could be obtained for study it might be found to be a form of the latter as it is often difficult to separate the species of *Fusconaia* and *Pleurobema* solely on the basis of shell characters. Even from character of shell, Frierson would group this species under *Fusconaia*; however, Walker, who considers this a valid species, would class it near *P. estabrookianum* (Lea).<sup>1</sup>

<sup>1</sup> More recently (April, 1915) Mr. Walker determines this species as a *Quadrula* of the *subrotunda* group (Nautilus XXVIII, Pl. V., figs. 1 and 2).

**Pleurobema Utterbackii** Frierson.<sup>2</sup> New Species.*Pl. V., Figs. 12 a and b; Pl. XX., Figs. 63 A —D.*

## ANIMAL CHARACTERS.

"NUTRITIVE STRUCTURES:—Branchial opening with many short antennae; anal very finely crenulated; supra-anal with short but distinct mantle connection to anal; gills long, much pointed posteriorly, inner laminae of inner gills free from visceral mass; palpi wide, short connected about two-thirds of their length antero-dorsad; color of soft parts mostly a light tan, mantle edges at siphonal openings blackish, gills of male and sterile female a darker tan.

"REPRODUCTIVE STRUCTURES:—No gravid females found, but sterile ones only present outer gills as marsupial; sterile marsupia wider with more crowded septa than outer gills of male.

## SHELL CHARACTERS.

"EXTERNAL STRUCTURES:—Shell elliptical, somewhat rhomboidal; evenly truncate above posteriorly; beaks at one fourth of their length; epidermis rough, dark reddish brown, faintly rayed when young; post-slope somewhat biangular and low; beaks rather strongly corrugate.

"INTERNAL STRUCTURES:—Cardinals teeth roughish, inclined to be double in both valves; laterals long, medium size; inter-dentum narrow; muscle scars well marked and separate; cavity of shell irregular, that of the beaks of medium depth; nacre white, sometimes pinkish, iridescent behind.

Sex	Length	Height	Diameter	Locality
♀	68 x	42 x	26 mm	(White River, Hollister)
♂	65 x	41 x	25.5 "	(Jack's Fork of Current R.)
♂	18.5 x	12.5 x	7.5 "	( " " " " " )
♀	18.0 x	12.5 x	7.0 "	(White R., Hollister)

"Two juvenile shells are at hand measuring as above. Epidermis of latter olive-green, of the former, yellowish, both with fine rays; nacre of latter bluish, of the former pinkish; beak sculpture of both roughly corrugate, the three or four coarse ridges curved up posteriorly into hummocks and directing the apices

<sup>2</sup> This description of *Pleu. Utterbackii* is quoted from the M. S. of Mr. L. S. Frierson and is kindly permitted to be published here.

of the beaks anteriorly; post-ridge inflated but not so sharply angled as in juveniles of *Fusconaia*, nor so greatly rayed; beak sculpture also different in being more corrugated.

"MISCELLANEOUS REMARKS:—The type shell is from the White River, Hollister, Missouri, collected by Mr. Utterback of St. Joseph, Missouri, for whom the species is named. Other specimens are at hand from contiguous territory. This species might possibly be the *Pleu. argentea*--"*pannosa*" of C. T. Simpson (indicated, but hardly described, in Proc. Nat. Sci. Phil., 1900, p. 82). It is to be differentiated from the Eastern Tennessee *Pleurobema argenteum* (Lea) with difficulty, having its beaks further in front, and higher than in *argenteum*. Specimens have been received under the heterogeneous names of *L. ozarkensis* (Call), *ellipsiformis* (Conrad), etc. But a series of about a dozen sent by Mr. Utterback from two or more localities proves the novelty of the form. The appearances of *Truncilla* and *Pleurobema* in the mountain streams of Arkansas and Missouri, together with an undescribed *Lampsilis* very close to *biangulatus* (Lea), is an interesting and remarkable fact illustrating the power of environmental factors in the family."<sup>1</sup>

#### Genus *Elliptio* Rafinesque.

1819—*Elliptio* Rafinesque, Jour. de Phys. Chim. et His. Nat.

1900b—*Elliptio* Simpson, Proc. U. S. Nat. Mus., XXII, p. 700. (as section.)

1912b—*Elliptio* (Raf.) Ortmann, An. Car. Mus., VIII, pp. 265-272.

(Type, *Unio* [*Elliptio*] *nigra* Rafinesque).

ANIMAL CHARACTERS:—Branchial and anal openings large with many small papillae; mantle connections between anal and supra-anal short, or moderately so; gills wide, very much round

<sup>1</sup> Being more doubted by some students that *P. Utterbackii* may not be distinct from *L. ozarkensis* (Call), Mr. Frierson would make this additional description:—

"Our shell is much more tumid at the beaks, or umbones; it is not furrowed on the post slope by the siphonal ridges as in *ozarkensis*; it is thicker; the anterior muscle scars are distinct, while in *ozarkensis* they are remarkably confluent. Our shell is not dimorphic, while, if Call has not confused two species in one, his species is considerably so. Our shell differs especially from his figures 1 and 3, less so from fig. 4. Our shell has its whole facies of a heavier sort than *ozarkensis*. Our copies of the latter, from Mr. Call, are more inclined towards a *Lampsiline* structure, as indeed it is placed by C. T. Simpson."

ventrad, inner wider but not much longer, inner laminae almost entirely free from visceral mass; palpi medium size; color of soft parts whitish suffused with black; only outer gills marsupial; glochidia small, suboval, spineless.

**SHELL CHARACTERS:**—Shell thick, heavy, subsolid, rhomboid-ovate, longitudinal axis straight, disk smooth, beaks rather low, not near anterior end, sculptured with a few fine concentric ridges angled at the base of the post-umbonal ridge; epidermis brown to black, faintly rayed or rayless; hinge teeth heavy; nacre varying from white to deep purple and violet.

**MISCELLANEOUS REMARKS:**—This genus falls into two groups for this State. The first group is represented by *E. nigra* (Raf.) which possesses a heavy subquadrate or subtrapezoidal type of shell but with obscure beak sculpture; the second group is represented by *E. dilatata* (Raf.) which has more of an elongate, gibbosed shell with a beak sculpture of thick, heavy, ridges running parallel to the growth lines. The two other groups of this genus (that is, *beadleianus* and *complanatus* groups) are not found in Missouri, the former being mostly a representative of some gulf states and the latter of the immediate Atlantic drainage. Dr. Ortmann used "*Elliptio*" as a generic name available for the "*American Unio*" and employs the original name, "*Unio*," in the sense of the "*European Unio*". The soft parts of this genus being practically identical with those of the genera immediately preceding, the species are indicated entirely on the basis of peculiar shell characters.

***Elliptio nigra* Rafinesque.<sup>1</sup>**

("Elephant's Ear," "Pink.")

*Pl. XXI, Figs. 64 and 65 A and B.*

1820—*Unio (Elliptio) nigra* Rafinesque, Ann. Gen. Sci. Brux., V, p. 291, pl. LXXX, figs. 1—4.

1823—*Unio cuneatus* Barnes, Am. Jl. Sci., VI, p. 263.

**ANIMAL CHARACTERS.**

**NUTRITIVE STRUCTURES:**—Branchial opening large, well set

<sup>1</sup> Simpson (1900 b, p. 706) applied the name "*Unio crassidens Lamarck*" to *E. nigra* Raf., but as previously stated under the description of *Megaloniais* (IV, p. 124) that close student of Lamarckian types, Mr. Bryant Walker, has settled the question by pronouncing *U. crassidens* (1819) as the so-called *U. trapezoides* of Lea (1831).

with numerous short papillae; anal opening with small, but very distinct, papillae; supra-anal briefly but well connected with anal by mantle edges; gills large, broad, pointed both anteriorly and posteriorly, inner broader, only slightly longer, than outer, inner laminae free from visceral mass; palpi moderately large, connected antero-dorsad, edges curved; color of soft parts dirty white with mantle edges at siphonal openings blackish and gills brownish.

**REPRODUCTIVE STRUCTURES:**—Only outer gills marsupial, when gravid marsupia moderately swollen; conglutinates rather well developed, leaf like, white; glochidia small, suboval, spineless, measures 0.130 x 0.150mm.

#### SHELL CHARACTERS.

**EXTERNAL STRUCTURES:**—Shell solid, heavy, subinflated, triangular in outline, post-umbonal ridge prominent; beaks also prominent sculptured by a few rather obscure ridges subparallel to growth lines and swollen at the base of post-ridge; disk more or less smooth; epidermis reddish brown to black often faintly rayed.

**INTERNAL STRUCTURES:**—Cardinals double in both valves, heavy; laterals heavy; interdentum long; beak cavities large not very deep; nacre (for *Mo. nigra*) only a deep purple—not variable.

Sex	Length	Height	Diameter	Locality
♂	126	x 80	x 51mm	(Miss. R., Hannibal)
♂	91	x 61	x 37 "	( " " " )
♀	115	x 66	x 47 "	(Meramec R., Meramec Highlands)

**MISCELLANEOUS REMARKS:**—No juveniles, nor young shells found. This is a rare species for the interior of the state being only in the Meramec, outside of the Mississippi River. In the latter, where it is not to say an uncommon shell, it is different from the one found in the Ohio by a variation in nacre-color. The shell may show some variation in size and form in the same river, as Wilson and Clark (1914, p. 42) observed in the Cumberland where it is short and chunky in the headwaters but is heavier and more elongate in the lower stretches. Although *nigra* is essentially a big river species, yet it is not found in the Osage—the largest Missouri River tributary. Its occurrence in the Meramec carries it farther west than recorded before. Its breeding record, although incompletely kept by the writer, shows it to be a tachytictic *Unio*.

***Elliptio dilatata* (Rafinesque).**

("Lady Finger," "Spike," "Pistol Grip.")

Pl. XXI, Figs. 66 A and B.

1820—*Unio (Elliptio) dilatata* Rafinesque Monog. of Bivalves of Ohio, Ann. Gen. Sci. Phys. Brux.1823—*Unio gibbosus* Barnes, Am. Jl. Sci., VI, p. 262, pl. XI, fig. 12.1838—*Unio arctior* Lea, Tr. Am. Phil. Soc., VI, p. 10, pl. IV, fig. 10.1912b—*Elliptio gibbosus* (Barnes) Ortmann, An. Car. Mus., VIII, p. 271.

## ANIMAL CHARACTERS.

**NUTRITIVE STRUCTURES:**—Branchial opening small with many short, blackish papillae; anal with a single row of low papillae; supra-anal separated from anal by short mantle connection; gills long and narrow, inner laminae of inner gills free—in some instances connected about one-fourth of the way anteriorly; palpi short, wide, connected antero-dorsad about two-thirds of their length; color of soft parts soiled grayish with area in front of branchial opening yellowish, pericardianl region invariably reddish brown.

**REPRODUCTIVE STRUCTURES:**—Only outer gills are marsupial, marsupia moderately swollen in center when gravid, dark tan; conglutinates narrowly lanceolate, always whitish; glochidia medium size, spineless, hinge line slightly depressed; measure 0.200 x 0.220mm.

## SHELL CHARACTERS.

**EXTERNAL STRUCTURES:**—Shell elongate-ellipsoid, gibbose, thick heavy, post-umbonal ridge rounded, inflated; disk smooth; beaks flattened, coarsely sculptured with five or six wavy ridges more pronounced behind; epidermis dark brown to horn or yellowish.

**INTERNAL STRUCTURES:**—Cardinals rather low, double in both valves; laterals double in left and inclines to double in right valve; interdentum very long, cut away in right to receive left post-cardinal; umbonal cavities rather shallow; however, deeper in female shell; nacre mostly dark purple, varies from all shades of purple to salmon and white.

Sex	Length	Height	Diameter	Um. ra.	Locality
♀	135	x 65	x 43.0	0.260	(Miss. R., Hannibal)
♂	120	x 50	x 38.0	0.255	(Osage R., Osceola)
♀	42	x 20	x 9.5	0.255	( " " " )
♂	39	x 18	x 9.5	0.250	(Niangua R., Hahatonka)



The last two measurements are those of the most adolescent shells at hand but are not young enough to present much additional information than can be obtained from the mature shell.

MISCELLANEOUS REMARKS:—This is one of the species of very wide geographic distribution in United States but is limited in this state for the interior to those streams south of the Missouri River where it is met with in a multitude of forms—especially of the small thin and compressed varieties found in the Ozarkian streams of South Missouri. In the Osage it is found most typically, aside from the Mississippi which produces the best types of all *Naiad* species. The depauperization of this species in size and form in the mountain streams is evidently due to a swifter current and hence these dwarfed forms may be merely a local ecologic race that may not deserve special names; however, two forms in this state occur often enough to require some little attention. *Dilatata* (Raf.) (= *gibbosus* (Bar.)) is more confused with *Ellipsaria clintonensis* (Simpson) than with any other shell. There is a difference, however, in the latter possessing capillary rays, and a broader interdentum, but the best distinction is in the marsupial structures of the latter that presents a folded appearance, when gravid. Simpson did not know the difference from shell structures until he found a gravid *clintonensis*. While this species is both lacustrine and fluviatile, yet it is never found in any lake or pond in this state. The typical *dilatata* with white nacre (*E. arctior*) is simply put down in the synonymy. A form like Conrad's *U. arcus* is sometimes found in the Osage but aside from its shortened dwarfed form of shell it does not even possess enough differentiating characters to give it a varietal place. The writer has found it to be gravid only from June to August; hence tachytictic.

***Elliptio dilatata subgibbosa* (Lea).**

("Little Lady Finger," "Little Spike.")

Pl. XXI., Figs. 68 A—D

1857—*Unio subgibbosus* Lea, Pr. Ac. N. Sci. Phila., IX, p. 169; 1858, Jl. Ac. N. Sci. Phila., IV, p. 53, pl. VI, fig. 36.

1868—*Unio lazarus* Sowerby, Conch. Icon., XVI, pl. LXVIII, fig. 348.

ANIMAL CHARACTERS:—Absolutely identical with those of the parent. No real difference in glochidial characters even.

SHELL CHARACTERS:—Moderately small, short, rather inflated, somewhat heavy through the post-ridge, more elliptical,

not so pointed posteriorly, older shells tending toward post-dorsal truncation, dorsal line arched, ventral rather straight, epidermis brownish; nacre white with pinkish umbonal cavity or solid color.

Sex	Length	Height	Diameter	Locality
♀	70	x 30	x 20mm	(Black R., Williamsville)
♂	56	x 26	x 13 "	( " " " " )
♀	46	x 23	x 12 "	( " " " " )

MISCELLANEOUS REMARKS:—Specimens collected from streams in Stone County have been sent to the Division of Mollusks in the National Museum where they were identified as *subgibbosus*. It has also been reported from the streams of Texas and Shannon Counties. It is different from the variety *delicatus* of Simpson by being somewhat larger, not so thin-shelled, more arched dorsad, more pointed both anteriorly and posteriorly, with rather prominent post-umbonal ridge. This variety is rather common in the Black and St. Francis drainage.

***Elliptio dilatata delicata* (Simpson).**

("Little Lady Finger.")

Pl. XXI., Figs. 68 A—D.

1900b—*Unio gibbosus delicatus* Simpson, Proc. U. S. Nat. Mus., XXII, p. 704.

ANIMAL CHARACTERS:—Although the anatomy of this variety is smaller than the parent, yet it is precisely identical. Only sterile individuals found; however, only outer gills marsupial.

SHELL CHARACTERS:—Shell greatly compressed, very small, thin, outline evenly elliptical; epidermis brownish red to olivaceous; hinge teeth rather prominent, thin, nacre purple or coppery-rarely white.

Sex	Length	Height	Diameter	Locality
♂	55	x 26	x 13 "	(White R., Hollister)
♀	48	x 24	x 11 "	( " " " " )
♂	43	x 21	x 10 "	( " " " " )

MISCELLANEOUS REMARKS:—The writer has in his collection a shell of this subspecies bearing the original label of Mr. Simpson, the author. The *dilatata* shells of the White River compare well to it. For the same ecologic reason we may account for this small form in the South Missouri drainage as well as for the occurrence of *subgibbosa*. These two forms are not found north of the Ozark divide, neither is the typical *dilatata* of Rafinesque found south of it in this State showing the ready response of the parent species to different environmental conditions.

Genus *Uniomereus* Conrad.

1853—*Uniomereus* Conrad, Proc. Ac. Nat. Sci. Phila, VI, p. 268. (as genus).

1900b—*Uniomereus* (Conrad) Simpson, Proc. U. S. Nat. Mus., XXII, p. 739 (as section).

(Type, *Unio tetralasmus* Say).

ANIMAL CHARACTERS:—Both branchial and anal openings papillose and crenulate; supra-anal closely and loosely connected to anal; inner laminae of inner gills free from the visceral mass almost their full length; papli short almost as wide as long; color of soft parts mostly a soiled white, gills brownish; gills only marsupial in outer ones, when gravid rather distended lengthwise in center, tapering at the ventral edge, ovisacs not divided; septa wavy; conglutinates white, sole-shaped; glochidia medium in size, semielliptical, higher than long, hinge line straight.

SHELL CHARACTERS:—Shell trapezoidal, rather obtusely pointed behind; disk smooth with the exception of roughened growth lines; beaks low, sculptured with several coarse concentric ridges which curve abruptly upward behind where they are crowded closely together; epidermis rayless, shiny, yellowish to black; cardinals compressed; laterals nearly straight; nacre whitish to bluish.

MISCELLANEOUS REMARKS:—Dr. Ortmann elevates *Uniomereus* from Simpson's treatment of it as section mostly because of the peculiar beak sculpture of its type since this character alone is a great departure from the *Elliptio*-shell (See Plate xxi, fig. 69). Then, too, the shell is thinner, has more of a rayless, vari-colored polished epidermis and is more elongated with less curved dorsal or ventral line.

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OUR BIRDS IN THE SUMMER OF 1914.

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BY BROTHER ALPHONSUS, C. S. C.

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In this article I have recorded the more interesting of my observations made during the summer of 1914, in the hope that they may be found serviceable especially to students of bird life who may not have equal opportunities to observe birds in their native haunts. Very few persons, like the writer, can find

time for daily observations, and these may often wish for first-hand information which may answer many questions that they can not answer themselves.

Another advantage to be gained by recording the facts that are furnished by frequent observations of our birds is the accumulation of data for a fuller life history of the different species in a particular locality. And the element of time is not the least important in these records—such as the time of nesting; when the young are fledged; dates of the first and last brood of certain species; habits of species at different periods, etc. Lastly, the writer's privilege of visiting deep woods in August, which few observers near cities can enjoy, has revealed a number of interesting ornithological secrets.

Daily observations also disclose some interesting facts about species that are very rare during certain seasons of the year. In 1914 species that were seen not oftener than three times in one or more of the summer month were: Least Flycatcher, Night-hawk, Scarlet Tanager, Red-eyed Vireo, Purple Martin, Redstart, Black-billed Cuckoo, Cardinal, Hummingbird, Savanna Sparrow, Phoebe, Bobolink, Blue Jay, Bronzed Grackle, Crested Flycatcher, Loggerhead Shrike, Black and White, Canadian, Pine, Black-throated Green, Nashville, Magnolia, Yellow, Warblers.

The Crow had the fewest records in June of any month of the year, both in 1914 and 1913—13 for the former and 12 for the latter. In 1914 the longest interval between any of the dates was 7 days; in 1913, 4 days. In July there were 29 records for 1913 and 20 for 1914. In August, 1914, the only day the species did not appear was on the 2d; in 1913, there were 6 days in August when the Crow was not found.

In June the Blue Jay maintained a better showing than the Crow—17 records for 1913 and 22 for 1914. In both years the longest absence was 4 days. In July 1914 there were four days when the species was not seen; in 1913 there were no records for the Jay. The writer spent July at Bankson Lake, near Lawton, Mich. In August there were 9 records in 1913, made at Notre Dame, Indiana, and none before the 11th of the month, when the writer was in Michigan. In August, 1914 there were but two records—made in Indiana. As reported in a previous article, the Blue Jay was found formerly in small numbers at Bankson Lake,

but the records of the past three years indicate that the species has permanently departed from this vicinity.

In June, 1914 the White-breasted Nuthatch was recorded on four days, after the 24th; in 1913 there were 7 records—all after the 19th. The migration of the species during the nesting season has been quite regular for the last ten years, only rarely has an individual been found nesting at Notre Dame. Who will give a satisfactory explanation of the spring migration of this Nuthatch?

The Bluebird had 7 records in June 1914 and 1913. In July 1914 there were also 7 records; in 1913, 28 records were made at Bankson Lake. In August there were 29 records in 1914 and 20 in 1913, the larger record being made in Michigan. These records clearly show that a favorable locality will make a marked difference in the number of records of certain species.

June 1, 1914.—Young Thrasher flying; tails short.—June 9.—Flicker feeding young in nest; young birds, noisy.—First note of young Baltimores.—June 15.—Families of Blue Jays and Phoebe.—June 17.—A male Cardinal bathing at the edge of a small lake; another flew out of a nearby willow tree. Both flew toward a swamp not far away, and one began to whistle continuously.—June 19.—Young Robins plentiful near a lake; Bronzed Grackles numerous in an oak grove.—June 20.—A Crow attacked by a Baltimore Oriole; young Baltimores out of nest; nearly full grown.—June 21.—Song Sparrow's nest on ground in tall grass—three eggs, one darker than the others at the larger end; bird flew off the nest as I approached.—June 24.—A Towhee with an unmusical note at top of tall tree.—June 25.—Orchard Oriole's nest in spruce tree; female feeding young; young calling constantly.—June 26.—Cowbirds in a large flock in a field.—June 29.—Young Chipping Sparrow flying.

July 3, 1914.—Red-shouldered Hawk attacked by a Red-winged Black bird.—July 5.—Two Savanna Sparrows feeding in grass and a walk near a lake.—July 9.—Two young Kingbirds resting on a dead branch of a tree growing on a small island; old birds flying from same tree.—Young Red-headed Woodpecker; first seen this year.—Young Robins and Flickers very plentiful near the shore of a small lake.—July 11.—A Hummingbird resting on a dead twig in an apple tree; kept turning its head; flew away in a minute.—July 12, 7:45 p. m.—Swift entering a chimney.—July 18.—Note of Cardinal and Purple Martins near St. Joseph

River.—July 24.—Meadowlarks singing loud, but not long.—  
 July 25.—Catbird still in full song; few notes of a Thrasher.—July  
 26.—Gnatcatcher at the edge of a wood near St. Joseph River.—  
 July 28, 4:30 p. m.—A Cardinal singing long; Orchard Orioles  
 plentiful,—near St. Joseph's River.

August 3, 1914.—Arrived at Bankson Lake near Lawton,  
 Mich.—Aug. 5.—A young Robin just able to fly, in an oak grove.—  
 Aug. 6.—Sandhill Crane flying over the lake.—Arcadian Fly-  
 catcher in deep woods.—Aug. 7.—Red-headed Woodpeckers  
 plentiful in open woods near the lake; not in deep woods at all.—  
 Deep woods.—Call-note of Scarlet Tanager; notes of Yellow-  
 throated Vireo; first time heard this year.—Aug. 8.—Deep  
 woods.—Tanager in full song; scarlet on belly fading.—Sandhill  
 Crane flew from perch in a tree.—Aug. 10.—Deep-woods.—First  
 Warblers arrived.—Aug. 11.—Young Tanager—yellowish beneath;  
 wings and tail becoming black.—Aug. 15.—Bobolinks in a field  
 and in bushes—near a pond; in autumn plumage; call-note  
 musical; a good-sized flock—25 or 30.—Aug. 16.—Cedarbirds  
 on grape vine. Other birds also eating grapes; such as, Baltimore  
 Orioles, Catbirds.—Aug. 24, A. M. and P. M.—Warblers in force.—  
 Aug. 30.—Loggerhead Shrike in a lane in a pasture; perched on  
 fence posts and wire; flew ahead of me as I approached, but  
 allowed me to come very close before flying; first seen this summer.

## JUNE.

Crow, 1, 2, 4, 8, 16, 17, 19, 20,	Robin, 1 to 30.
22, 25, 26, 28, 30.	Bluebird, 1, 2, 3, 15, 18, 20, 22.
Blue Jay, 1, 2, 3, 6 to 9, 14 to	Killdeer, 1 to 5, 7, 8, 9, 12, 14,
18, 20, to 25, 27 to 30.	19, 20, 24, 25, 27, 30.
Goldfinch, 1 to 4, 6 to 12, 14	Bronzed Grackle, 1 to 13, 15 to
to 25, 27 to 30.	30.
White-breasted Nuthatch, 24,	Cowbird, 1 to 25, 27 to 30.
25, 28, 30.	Red-winged Blackbird, 1 to 13,
Song Sparrow, 1 to 30.	16, 17, 19, 20 to 26, 28, 29.
Vesper Sparrow, 1 to 4, 6 to	Kingfisher, 5, 8, 10, 12, 14, 15,
30.	17, 19 to 22, 24, 25, 27, 28, 30.
Field Sparrow, 1 to 30.	Mourning Dove, 1 to 5, 8 to 30.
Chipping Sparrow, 1, 3 to 19,	Towhee, 14, 20, 21, 24, 26 to 29.
21 to 30.	Brown Thrasher, 1, 2, 3, 5 to 8,
Meadowlark, 1 to 30.	10 to 13, 15 to 21, 23 to 30.

- Flicker, 1 to 30.  
 Catbird, 1 to 4, 6 to 30.  
 Barn Swallow, 1, 4, 6, 7, 12, 17,  
     20, 22, 27, 29, 30.  
 Spotted Sandpiper, 1, 2, 3, 6, 8  
     to 14, 16, 17, 18, 21 to 26,  
     28, 29, 30.  
 Baltimore Oriole, 1 to 30.  
 Orchard Oriole, 1 to 30.  
 House Wren, 1 to 30.  
 Chimney Swift, 1 to 30.  
 Kingbird, 1 to 30.  
 Wood Pewee, 1 to 30.  
 Crested Flycatcher, 1, 2, 3, 5, 6,  
     8 to 15, 18, 19, 21, 22, 25 to  
     30.  
 Least Flycatcher, 24.  
 Alder Flycatcher, 2, 3, 4, 10.  
 Nighthawk, 30.  
 Scarlet Tanager, 17.  
 Warbling Vireo, 1 to 30.  
 Red-eyed Vireo, 1, 29.  
 Indigo Bird, 1, 2, 6 to 10, 12,  
     13, 14, 17 to 22, 24 to 27,  
     29, 30.  
 Bobolink, 14, 19, 21, 24.  
 Dickcissel, 1, 2, 4, 6 to 10, 12,  
     19, 22, 26, 27.  
 Purple Martin, 21  
 Yellow-billed Cuckoo, 1, 2, 3, 6,  
     8, 9, 11 to 16, 18, 19, 21 to 30.  
 Black-billed Cuckoo, 24.  
 Cedarbird, 1, 2, 3, 4, 6 to 19,  
     21 to 25, 28.  
 Hummingbird, 17.  
 Redstart, 4.  
 Maryland Yellowthroat, 1, 2, 3,  
     4, 6 to 11, 13, 16 to 26, 29.  
 Red-headed Woodpecker, 1 to  
     17, 19 to 24, 26 to 30.  
 Downy Woodpecker, 1, 20, 21,  
     24.  
 Hairy Woodpecker, 18, 19, 24.  
 Cardinal, 7, 17, 29.

Total number of species seen, 52.

#### JULY.

- Crow, 2 to 5, 9, 10, 11, 15, 16,  
     18, 19, 20, 22, 24, 26 to 31.  
 Blue Jay, 1 to 11, 14, 15, 17,  
     18, 20 to 31.  
 White-breasted Nuthatch, 2 to  
     7, 9, 10, 11, 13 to 17, 20 to 24,  
     30, 31.  
 Red-headed Woodpecker, 1 to  
     31.  
 Downy Woodpecker, 2, 5, 7, 8,  
     11, 12, 14, 15, 20, 22, 23, 24,  
     26 to 30.  
 Savanna Sparrow, 5  
 Song Sparrow, 1 to 31.  
 Vesper Sparrow, 1 to 11, 13 to  
     16, 18 to 31.  
 Field Sparrow, 1 to 31.  
 Chipping Sparrow, 1 to 18, 20  
     to 30.  
 Meadowlark, 1 to 15, 17, 19,  
     20, 22, 23, 24, 26, 29.  
 Robin, 1 to 31.  
 Bluebird, 3, 15, 16, 20, 23, 26, 28.  
 Killdeer, 1, 2, 4, 6, 7, 9, 10, 13,  
     15, 18, to 22, 25, 28, 30.  
 Bronzed Grackle, 1 to 31.  
 Cowbird, 1 to 13, 15, 16, 18,  
     21, 23, 24, 26 to 29.



- Red-winged Blackbird, 1 to 7, 9 to 13, 15 to 18, 21, 23, 24, 26, 29, 30.  
 Kingfisher, 2, 3, 5, 7, 8, 9, 12, 15, 16, 18, 20 to 27, 30, 31.  
 Mourning Dove, 1 to 31.  
 Red-shouldered Hawk, 3, 24.  
 Towhee, 1, 3, 7, 9, 12, 14, 25, 27, 29, 30.  
 Flicker, 1 to 31.  
 Brown Thrasher, 1 to 12, 14 to 25, 27 to 30.  
 Catbird, 1 to 31.  
 Barn Swallow, 2, 5, 15, 20, 22, 23, 31.  
 Spotted Sandpiper, 1, 2, 3, 4, 5, 11, 15, 18, 20, 23, 28.  
 Baltimore Oriole, 1 to 31.  
 Orchard Oriole, 1 to 12, 14 to 21, 24, 27 to 30.  
 House Wren, 1 to 31.  
 Chimney Swift, 1 to 21.  
 Kingbird, 1 to 31.  
 Wood Pewee, 1 to 31.  
 Phoebe, 4, 5.  
 Crested Flycatcher, 1, 2, 3, 8 to 16.  
 Alder Flycatcher, 10, 15, 16, 19 to 22, 24 to 27.  
 Nighthawk, 1.  
 Indigo Bird, 1 to 24, 26 to 30.  
 Warbling Vireo, 1 to 31.  
 Bobolink, 1, 2.  
 Purple Martin, 18, 19, 24, to 27, 29.  
 Yellow-billed Cuckoo, 1 to 6, 11, 12, 15 to 24, 26 to 31.  
 Cedarbird, 1, 3, 4, 5, 11, 13, 15, 16, 20, 24, 26, 27, 28.  
 Hummingbird, 11, 14, 20, 23.  
 Maryland Yellowthroat, 5, 7, 8, 10, 14, 16, 22 to 27, 30.  
 Cardinal, 18, 28, 29.  
 Bobwhite, 8, 12.  
 Lesser Yellowlegs, 22, 24, 26, 30.  
 Sandhill Crane, 26.  
 Goldfinch, 2 to 31.  
 Gnatcatcher, 27, 28, 29.  
 Screech Owl, 20, 31.

Total number of species seen, 51.

#### AUGUST.

- Crow, 1, 3, 4 to 31.  
 Blue Jay, 1, 2.  
 White-breasted Nuthatch, 1, 3, 4 to 16, 18 to 31.  
 Red-headed Woodpecker, 1 to 4, 6 to 12, 14 to 31.  
 Downy Woodpecker, 1, 2, 4 to 10, 12 to 16, 18 to 20, 22 to 24, 26 to 29, 31.  
 Hairy Woodpecker, 10, 30.  
 Goldfinch, 1 to 31.  
 Song Sparrow, 1 to 22, 24 to 31.  
 Vesper Sparrow, 6, 29, 31.  
 Field Sparrow, 1 to 31.  
 Chipping Sparrow, 1, 2, 4 to 27, 29, 30, 31.  
 Savanna Sparrow, 13, 19, 27.  
 Swamp Sparrow, 13, 30.  
 Robin, 1 to 18, 20 to 31.  
 Bluebird, 1, 3, 4 to 9, 11 to 31.  
 Killdeer, 1, 3, 4, to 11, 21, 22, 24, to 31.  
 Bronzed Grackle, 1, 2, 3.  
 Cowbird, 1, 11, 13, 14, 15.  
 Red-winged Blackbird, 1, 4 to 8, 11, 12, 18, 22, 24, 27.

- Kingfisher, 4 to 31.  
 Mourning Dove, 1 to 4, 6, 8, 10,  
     15, 16, 18, 21, 22, 24, 25, 27,  
     29, 30.  
 Towhee, 7, 18, 26, 27.  
 Flicker, 2, 4 to 8, 10 to 13, 15  
     to 20, 22 to 31.  
 Brown Thrasher, 1, 2, 11.  
 Catbird, 1 to 9, 11, 14 to 18,  
     20, 24 to 27, 29, 30.  
 Spotted Sandpiper, 3 to 7, 10, 12,  
     13, 15 to 25, 28, 29, 31.  
 Orchard Oriole, 1, 5, 6, 7, 8, 10.  
 House Wren, 1, 2, 3, 29, 31.  
 Chimney Swift, 1, 2, 15, 16.  
 Kingbird, 1 to 21, 24 to 26, 28,  
     30, 31.  
 Wood Pewee, 1 to 31.  
 Phoebe, 3, 4, 6, 9, 10, 12, 14,  
     21, 23, 24, 25, 27, 29, 31.  
 Crested Flycatcher, 19, 24.  
 Least Flycatcher, 11, 15, 21, 29.  
 Alder Flycatcher, 4, 5, 6, 7, 9, 10.  
 Acadian Flycatcher, 5 to 14, 16,  
     17, 19, 20, 21, 22, 26, 27, 31.  
 Gnatcatcher, 27, 28, 29, 30, 31.  
 Indigo Bird, 1, 3 to 14, 16, 17,  
     18, 21, 22, 24 to 27, 29, 30, 31.  
 Warbling Vireo, 1 to 9, 11, 12,  
     14, 15, 17, 18 to 22, 24 to 31.  
 Red-eyed Vireo, 3 to 12, 14, 16  
     to 22, 24 to 31.  
 Yellow-throated Vireo, 7, 14,  
     18, 22, 24, 26, 28, 31.  
 Bobolink, 15, 19 to 22, 24 to  
     28, 30.  
 Purple Martin, 12.  
 Black-billed Cuckoo, 26.  
 Yellow-billed Cuckoo, 2, 4, 6, 7,  
     8, 10, 11, 12, 14, 16 to 19,  
     22 to 25, 29, 30.  
 Cedarbird, 6, 8, 11, 12, 16, 17,  
     19, 22, 24 to 29, 31.  
 Hummingbird, 1, 2, 3, 26, 27, 30.  
 Scarlet Tanager, 5, 7, 8, 11, 26.  
 Great Yellowlegs, 5, 12, 13, 16,  
     24, 25, 29, 31.  
 Lesser Yellowlegs, 2, 3, 4, 6, 7,  
     8, 10, 11, 12, 14 to 18, 20, 21,  
     22, 24 to 31.  
 Hell Diver, 5 to 12, 14 to 22,  
     24, 25, 26, 28, to 31.  
 Sandhill Crane, 6, 7, 8, 12 to  
     15, 17 to 21, 23 to 26, 28, 30.  
 Screech Owl, 4, 7, 8, 9, 25.  
 Eave Swallow, 3 to 6, 9 to 21,  
     25, 26, 29, 30.  
 Tree Swallow, 5, 7, 9, 13, 15.  
 Loggerhead Shrike, 30.  
 Yellow Warbler, 4, 5, 8.  
 Black and White Warbler, 10,  
     31.  
 Black-throated Green Warbler,  
     11, 31.  
 Canadian Warbler, 24.  
 Pine Warbler, 24, 27.  
 Blackburnian Warbler, 24, 25,  
     30, 31.  
 Nashville Warbler, 24, 26, 30.  
 Magnolia Warbler, 26, 28.  
 Overbird, 24.  
 Redstart, 10.  
 Sparrow Hawk, 21, 31.  
 Red-shouldered Hawk, 3, 4, 6,  
     8, 9, 11, 12, 14, 16, 19, 24  
     to 31.  
 Chickadee, 4 to 8, 10 to 12, 14  
     16, 18, 20 to 27, 30, 31.

Total number of species seen, 69.

Total number of species seen during summer, 75.

## ENUMERANTUR PLANTAE DAKOTAE SEPTENTRIONALIS VASCULARES.—II.

ENUMERAVIT J. LUNELL.

### The Vascular Plants of North Dakota.—II.

With Notes by J. Lunell.

#### Order 8. GLUMIFLORAE.

[Lobelius. Hist. 1, (1576).] [He has *Carices* and *Gramina* together in his treatment, though he has no name for the group.]  
C. A. Agardh, Aphor. 139. (1823).

*Graminales* Britton, Man. 60. (1901).

Family 13. **CULMIFERAE** Ray, Meth. 147. 149 (1682).

*Gramineae* B. Juss. Hort. Trian. ex A. Juss. Gen. LXIV et 28. (1789). *Gramina* Hall. Enum. Stirp. Helvet. 1, 203 (1742).  
Linn. Phil. Bot. 28, (1751). *Graminia* Dum. Agrost. Belg. 79. (1823).

Tribe I. **MAYDEAE** Dumortier B. C. Observations sur les Graminées 84. 90. (1823) Agrostographia Belgica, Tent.

*MAYS* Acosta, Tract. Drog. (1578).

*Maiz* Caesalpinus De Plantis 181. (1583), Cam. Hort. Med. 94. (1588). *Maizum* Monardes ex C. Bauhin. Pin. 25. (1623).  
*Maizium* et *Maizum* Dodonaeus, Herb. 822. (1618). *Mays* Tour. Éléms 423 (1694). I. R. H. 531. (1700). *Zea* Linn. Gen. 279 (1737), 419. (1754). *Thalysia* Linn. Syst. (1735)! also Fund. Bot. 244. *Zea* Fund. Bot. 242.—Not *Zea* or *Zeia* Dioscorides = *Triticum Spelta* Linn.

49. **Mays Acostae** Tour. Éléms." I. c. (1694).

*Zea Mays* Linn. Sp. Pl. 971. (1753).

Occasionally escaping. Leeds.

Tribe II. **ANDROPOGINEAE** Dum. Obs. Gram. et Agrost. Belg. 84. (1823).

*Andropogoneae* J. Presl. et C. Presl. Rel. Haenck. I. 331. (1830).

**ANDROPOGON** Royen Fl. Leyd. Pr. 52. (1740).

*Andropogon* Linn. Gen. 468. (1754).

50. *Andropogon scoparius* Michx. Fl. Bor. Am. I. 57. (1803).  
Leeds, Towner, Butte.

51. *Andropogon Hallii* Hack. Sitz. Acad. Wiss. Wien. 89. 127. (1884).

Morton Co.: Pretty Rock (Bell); Pleasant Lake.

52. **Andropogon furcatus** Muhl. Willd. Sp. Pl. 4:919. (1806).  
Leeds, Butte, Minot, Des Laes.

**CHALCOELYTRUM** Lunell, nom. nov. (from χαλκός copper, and ἔλκτρον, husk, alluding to the copper-tinted glumes of the spikelets).

*Chrysopogon* Trin. Fund. Agrost. 187. (1820). *Sorghastrum* Nash, Britt. Man. 71. (1901), name built on *Sorghum* and just as cheap and undesirable as diminutives in *ella*.

53. **Chalcoelytrum nutans** (Linn.) Lunell.

*Sorghastrum nutans*, (Linn.) Nash, in Small, Flor. South-eastern U. S. 66. (1903).

*Sorghum avenaceum* (Michx.) Chapm. Fl. S. States 583. (1860).  
Butte, Towner.

Tribe III. **PANICEAE** Dum. Obs. Gram. et Agrost. Belg. 83. (1823).

**MILIUM** Plinius 18:7. Virgilius, Georg. 1:216 Colum. 2:7-9. Cels. 2:18. Palad. 1:30 = *Panicum miliaceum* Linn. Sp. Pl. 58 (1753) = type of what we now call *Panicum* Linn. (restricted genus of the manuals) = *Chasea* Nwd. Am. Midl. Nat. Vol. II., p. 64 (1911).—This is *Milium* Moench. Meth. 202 (1794) inclusive of *Echinochloa* Beauv. Agrost. 53. (1812). Another synonym is *Cenchrus* Hippokrates Morb. 1. 619.

54. **Milium capillare** (Linn.) Moench l. c. 203.

*Panicum capillare* Linn. Sp. Pl. 58. (1753).  
Leeds.

55. **Milium barbipulvinatum** (Nash.) Lunell.

*Panicum barbipulvinatum* Nash. Mem. N. Y. Bot. Gard. Vol. I: 21. (1900).

Leeds, Devils Lake, Bismarck.

56. **Milium panicum** Mill. Gard. Dict. No. 1 (1759).

*Panicum miliaceum* Linn. Sp. Pl. 58. (1753).

*Milium esculentum* Moench. Meth. 203 (1794).

Fargo (Bergman et Stevens); Leeds.

57. **Milium virgatum** (Linn.) Lunell.

*Panicum virgatum* Linn. Sp. Pl. 59 (1753).

Leeds, Bismarck.

58. **Milium virgatum elongatum** (Vasey) Lunell.

*Panicum virgatum elongatum* Vasey, Bull. Torr. Bot. Club,

13: 26. (1886).

Leeds.

59. **Milium Leibergii** (Vasey) Lunell.

*Panicum Leibergii* (Vasey) Scribn. in Britton and Brown, Illustr. Fl. 3: 497. (1898).

*Panicum scoparium Leibergii* Vasey, U. S. Dept. Agric. Div. Bot. Bull. 8: 32. (1889).

Butte, Oberon.

60. **Milium Wilcoxianum** (Vasey) Lunell.

*Panicum Wilcoxianum* Vasey l. c.

Butte, Towner; Kuhn (Brenckle).

*ECHINOCHLOA* Beauv. Agrost. 53. t. 11. (1812). *Milium* Moench, in part.

61. **Echinochloa Crus-galli** (Linn.) Beauv. l. c.  $\alpha$  *submutica* (Neilr.) Beck v. M., in Neuman, Sveriges Fl. p. 777. (1901).

*Panicum Crus-galli* Linn. Sp. Pl. 56. (1753), in part.

Leeds.

62. **Echinochloa Crus-galli** (Linn.) Beauv. l. c.  $\beta$  *aristata* (Rehb.) Beck v. M., Neuman l. c.

*Panicum Crus-galli* Linn. l. c., in part.

Leeds, Bismarck.

63. **Echinochloa frumentacea** (Roxb.) Link.

*Panicum frumentaceum* Roxb., Japanese Barn-yard Millet, or Billion Dollar Grass, an occasional escape from cultivation. Vide Gray's Manual Ed. VII. p. 117. (1908).

In roadside ditch, Towner.

**PANICUM** (Plinius) Linn. Sp. Pl. 55. (1753).

*Setaria* Beauvais, Agrost. 112 (1812), not Aschers. 1798.

*Ixophorus* Schlecht, Linnæa 31. 420. (1861-2).

*Chamaeraphis* R. Br. (1810) O. Kuntze (1891).

*Chaetochloa* Scribn. U. S. Dept. Agr. Bull. Agrost. 14. (1837).

64. **Panicum italicum** Linn. Sp. Pl. 56. (1753).

*Setaria italica* R. and S. Syst. 2: 493. (1817).

*Chamaeraphis italica* Kuntze, Rev. Gen. Pl. 768. (1891).

*Ixophorus italicus* Nash. Bull. Torr. Club. 22: 423. (1895).

*Chaetochloa italica* Scribn. l. c. 4: 39. (1897).

Leeds.

65. **Panicum viride** Linn. Sp. Pl. 2: 83. (1762).

*Setaria viridis* Beauv. Agrost. 51. (1812).

*Chamaeraphis viridis* Porter. Bull. Torr. Club 20: 196. (1893).

*Ixophorus viridis* Nash. Bull. Torr. Club. 22. 423. (1895).

*Chaetochloa viridis* Scribn. U. S. Dept. Agric. Div. Agrost. Bull. 4: 39. (1897).

Leeds.

66. *Panicum lutescens* Weigel Obs. Bot. 20. (1772).

*Chaetochloa lutescens* (Weigel) Stuntz, U. S. Dept. Pl. Ind. Seeds 33:36. 1914.

*Chaetochloa glauca* of recent authors.

Not *Panicum glaucum* Linn., which acc. to Stuntz is pearl millet, *Pennisetum americanum* (Linn.) Schum.

Cass Co.: Harwood (Bergman).

**NASTUS** Dioscorides I:114 = *Cenchrus frutescens* Linn. Bubani in Fl. Pyr. IV. (1901) takes up the name. Not *Cenchrus Hippokrates* L. c. *Panicastrella* Micheli, Nov. Pl. Gen. 36. (1719) an ugly diminutive of *Panicum*, taken up by Moench. *Echinaria* Heist. Syst. Pl. Gen. 12. (1748).

67. *Nastus carolinianus* (Walt.) Lunell.

*Cenchrus carolinianus* Walt. Fl. Car. 79. (1788).

*Cenchrus tribuloides* Am. authors, not Linn.

Bismarck.

Tribe IV. **ORYZEA** Dum. Obs. Gram. et Agrost. Belg. 83. (1823).

**CERATOCHAETE** Lunell, nom. nov. (from *κέρας*, a horn, and *χαίτη*, a bristle, named in reference to the long, stiff awns in the pistillate spikelets).

*Zizania* Linn. Sp. Pl. 991. (1753), not *Zizanon* of the New Testament, which is *Lolium temulentum*.

68. *Ceratochaete aquatica* (Linn.) Lunell.

*Zizania aquatica* Linn. Sp. Pl. l. c.

In James River at Jamestown.

**LEERSIA** Sw. Nov. Gen. et Sp. 21. (1788).

*Homalocenchrus* Mieg.; Hall. Hist. Stirp. Helv. 2: 201. (1768).

A poor name.

69. *Leersia oryzoides* (Linn.) Sw. Fl. Ind. Occ. I:132. (1797).

*Phalaris oryzoides* Linn. Sp. Pl. 55. (1753).

*Homalocenchrus oryzoides* (Linn.) Poll. Hist. Pl. Palat. 1:

52. (1776).

Jamestown.

Tribe V. **PHALARIDEAE** Link. Hort. Berol. I:62. (1827).

**PHALARIS** Dioscorides 3: 149. Plinius 27: 12 et 102.

Also *Tragus*, *Matth*, *Anguillara*, *Turner*, *Dodonaeus*, *V. Cordus*, *Gesner*, *Lobelius*, *Caesalpinus*, etc.

70. *Phalaris arundinacea* Linn. Sp. Pl. 55. (1753), also Linn. Pan. Swan. Am. Acad. 2:38. (1751).

Leeds, Butte; Kulm (Brenckle).

71. *Phalaris canariensis* Linn. Sp. Pl. 54. (1753).

Seems to be the type of the genus as held by prae-Linnaeans. *Dodonaeus* says it is called "Canary-seed." Hence the specific name.

In waste places. Towner.

*HIEROCHLOE* J. G. Gmel. Fl. Lib. 1: 101. (1747).

*Savastana* Schrank, Baier. Fl. 1: 100. (1789).

72. *Hierochloe odorata* (Linn.) Wahlenb. Fl. Uyss. p. 32. (1820.)

*Holcus odoratus* Linn. Sp. Pl. 1048 (1753).

\* *Hierochloe borealis* R. S. Syst. 2: 513. (1817).

*Savastana odorata* Scribn. Mem. Torr. Club 5: 34. (1894).

Leeds, Butte.

Tribe VI. **AGROSTIDEAE** Kunth, Mem. Mus. Paris II:72. (1815), also Dum. l. c. 83. (1823).

*ARISTIDA* Linn. Sp. Pl. 82. (1753), also Gen. Pl. 35. (1754).

73. *Aristida longiseta* Steud. Syn. Pl. Gram. 420. (1855).

*Medora* (Bergman).

*STIPA* Linn. Sp. Pl. 78. (1753), also Gen. 34. (1754).

74. *Stipa viridula* Trin. Mem. Acad. St. Petersburg. (VI.) 2. 39. (1836). Gram. Suppl. 39. (1836).

Leeds, Butte.

75. *Stipa comata* Trin. et Rupr. Mem. Acad. St. Petersburg. (VI.) 5: 75 (1842), Agrost. 3. 75. (1842).

Leeds, Butte, Towner.

76. *Stipa spartea* Trin. Mem. Acad. St. Petersburg. (VI.) 1: 82. (1831).

*Medora* (Bergman).

*URACHNE* Trin. Fund. Agrost. 109. (1918).

*Oryzopsis* Michx. Fl. Bor. Am. I: 51. (1803). Name founded on *Oryza* and therefore not acceptable.

77. *Urachne micrantha* Trin. et Rupr. Mem. Acad. St. Petersburg. (VI.) 5: 16 (1842).

*Oryzopsis micrantha* Thurb. Proc. Phila. Acad. 1863, 78. (1863). Morton Co.: Swastika (S. W. Colebank.)



78. *Urachne asperifolia* (Michx.) Trin. Unifl. 1: 174 (1824).  
*Oryzopsis asperifolia* Michx. Fl. Bor. Am. 1: 51. (1803).  
 Devil's Lake, Turtle Mountains.  
*MUHLENBERGIA* Schreb. Gen. 44. (1789).
79. *Muhlenbergia mexicana* (Linn.) Trin. Unifl. 189. (1824).  
*Agrostis mexicana* Linn. Mant. 1: 31. (1767).  
 Benson Co.: Peninsula of Lake Ibsen?
80. *Muhlenbergia racemosa* (Michx.) B. S. P. Prel. Cat. N. Y. 67. (1788).  
*Agrostis racemosa* Michx. Fl. Bor. Am. 1: 53. (1803).  
*Muhlenbergia glomerata* Trin. Unifl. 191. (1824).  
 Leeds, Butte, Minot, Bismarck.
81. *Muhlenbergia foliosa* Trin. Gram. Unifl. 190. (1824).  
 Butte.
82. *Muhlenbergia umbrosa attenuata* Scribn. var. nov. ined.  
 Butte.
- STELEPHURAS* Theophrastus 7: 10, p. 842 Stapelius edition (1644), also Adanson, Fam. des Pl. II, p. 31. (1763).  
*Plantinia* Bubani Fl. Pyr. IV. p. 269. (1901).  
*Phleum* Linn. not *Phleum* Theophrastus. Hist.
83. *Stelephuras pratensis* (Linn.) Lunell.  
*Phleum pratense* Linn. Sp. Pl. 60. (1753).  
 Leeds, York, Pleasant Lake.
- TOZZETTIA* Savi Mem. Soc. Nat. Sc. VIII. 477. (1798).  
*Alopecurus* Linn. Syst. (1735). Gen. 18, (1737) not Theophrastus or prae-Linnaean.
84. *Tozzettia geniculata* (Linn.) Lunell.  
*Alopecurus geniculatus* Linn. Sp. Pl. 60. (1753).  
 Leeds, Oberon.
85. *Tozzettia fulva* (J. E. Smith) Lunell.  
*Alopecurus fulvus* J. E. Smith Engl Bot. 21. t. 1467. (1793).  
 Leeds.
- AGRESTIS* Bubani Fl. Pyr. IV. 281. (1901).  
*Agrostis* Linn. Syst. (1735). Gen. 19. (1737), 30. (1754), not Dioscorides 4: 30, or ancients.
86. *Agrestis alba* (Linn.)  
*Agrostis alba* Linn. Sp. Pl. 63. (1753).  
 Leeds, Jamestown.
87. *Agrestis hyemalis* (Walt.)  
*Cornucopiae hyemalis* (Walt.) Fl. Car. 73. (1788).

- Agrostis hyemalis* B. S. P. Prel. Cat. N. Y. 68. (1888).  
Leeds, Butte,; Kulm (Brenckle).  
*SPOROBOLUS* R. Br. Prodr. Fl. Nov. Holl. I: 169. (1810).  
88. *Sporobolus brevifolius* (Nutt.) Scribn. Mem. Torr.  
Club. 5: 39. (1895).  
*Agrostis brevifolia* Nutt. Gen. I: 44. (1818).  
Leeds.  
89. *Sporobolus depauperatus* Scribn. Bull. Torr. Club. 9:  
103. (1882).  
Leeds.  
90. *Sporobolus cuspidatus* (Torr.) Wood, Bot. et Fl. 385,  
(1870).  
*Vilfa cuspidata* Torr., Hook Fl. Bor. Am. 2: 238. (1840).  
Leeds, Dunsieith.  
91. *Sporobolus Richardsonis* (Trin.) Merr. in Rhodora. 46.  
*Vilfa Richardsonis* Trin. Mem. Acad. St. Petersburg. Ser. VI.  
Sc. Nat. V. 11. 103. (1840).  
Leeds, Butte, Towner.  
92. *Sporobolus cryptandrus* (Torr.) A. Gray. Man. 576.  
(1848).  
*Agrostis cryptandra* Torr. Ann. Lyc. N. Y. 1: 151. (1824).  
Pretty Rock (Bell); Pleasant Lake.  
93. *Sporobolus cryptandrus vaginatus* Lunell, Am. Midl.  
Nat. Vol. II. p. 123. (1911).  
Midl. Nat. Vol. II. p. 123. (1911).  
Pleasant Lake.  
94. *Sporobolus asperifolius* (Ness and Meyen) Thurber, S.  
Wats. Bot. Cal. 2: 269 (1880).  
*Vilfa asperifolia* N. et M., Trin. Mem. Acad. St. Petersburg. (VI.)  
6: 95. (1840).  
Devil's Lake, Minnewaukan.  
*DEYEUXIA* Clarion Beauv. Agrost. 43. pl. 9, f. 9, 10. (1812).  
*Calamagrostis* Adans. Fam. des Pl. 2: 31. (1763), in part.  
Bubani correctly objects to this name, because it is made up of  
*Calamus* and *Agrostis*, two names already used! Not *Calamagrostis*  
Trag. Hist. 677. 679. (1792), which is in one case a *Sparganium*,  
a *Cyperus*, and a *Juncus*!  
95. *Deyeuxia montanensis* (Scribn.) Lunell.  
*Calamagrostis montanensis* Scribn., Vasey Contr. U. S. Nat.  
Herb. 3: 83. (1892).

Leeds, Pleasant Lake.

96. *Deyeuxia canadensis* (Michx.) Munro; Hook. f. Trans. Linn. Soc. 23: 345.

*Agrostis canadensis* Michx. Fl. Bor. Am. 1: 73. (1803).

*Calamagrostis canadensis* Beauv. Agrost. 159. (1812).

Pleasant Lake.

97. *Deyeuxia neglecta* (Ehrh.) Lunell.

*Arundo neglecta* Ehrh. Beitr. 6: 137. (1791).

*Calamagrostis neglecta* Gaertn. Fl. Wett. 1: 94. (1799).

Pleasant Lake.

98. *Deyeuxia hyperborea* (Lange) Lunell.

*Calamagrostis hyperborea* Lange, Fl. Dan. 50: t. 3. (1880).

Leeds, Rolette.

99. *Deyeuxia hyperborea stenodes* (Kearney) Lunell.

*Calamagrostis hyperborea stenodes* Kearney Bull. U. S. Dept. Agric. Div. Agrost. II: 39.

Norderhof (Logan County): Brenckle.

100. *Deyeuxia hyperborea elongata* (Kearney) Lunell.

*Calamagrostis hyperborea elongata* Kearney, Bull. U. S. Dept. Agric. Div. Agrost. 11: 40.

Leeds, Pleasant Lake.

*ATHERNOTUS* Dulac, vide Bubani, Fl. Hauts Pyr. 74. (1867).

*Calamovilfa* Hack. True Grasses 113. (1890).

Here again comes the same objection to the permissibility of this name, it being a combination of two grass names like *Calamagrostis*.

101. *Athernotus longifolius* (Hook.) Lunell.

*Calamagrostis longifolia* Hook. Fl. Bor. Am. 2: 241. (1840).

*Calamovilfa longifolia* Hack l. c.

Leeds, Pleasant Lake.

Tribe VII. *AVENEAE* Nees. Nov. Act. Acad. Nat. Cur. XIX. Suppl. I: 154. (1823).

*SPHENOPHOLIS* Scribn.

102. *Sphenopholis obtusata* (Michx.) Scribn.

*Eatonia obtusata* (Michx.) A. Gray Man. 2: 558. (1856).

*Aira obtusata* Michx. Fl. Bor. Am. I: 62. (1803).

Leeds; Kulm (Brenckle).

*KOELERIA* Pers. Syn. 1: 97. (1805).

103. *Koeleria cristata* (Linn.) Pers. l. c.

- Aira cristata* Linn. Sp. Pl. 63. (1753).  
 Devil's Lake, Leeds, Willow City.
- TRISETUM* Pers. Syn. 1: 97. (1805).
104. *Trisetum melicoides* (Michx.) Vasey.  
*Aira melicoides* Michx. Fl. Bor. Am. 1: 62. (1803).  
*Grappophorum melicoideum* Beauv. Agrost. 164. (1812).  
 Butte.
- DESCHAMPSIA* Beauv. Agrost. 91. pl. 18. f. 3. (1812).
105. *Deschampsia caespitosa* (Linn.) Beauv. Agrost. 160.  
 pl. 18. f. 3. (1812).  
*Aira caespitosa* Linn. Sp. Pl. 64. (1753).  
 Sheyenne, Towner.
106. *Deschampsia flexuosa* (Linn.) Trin. Bull. Acad. Sci.  
 St. Petersburg. 1: 66. (1836).  
*Aira flexuosa* Linn. Sp. Pl. 65. (1753).  
 Leeds, Butte.
- AVENA* Vergilius Ecl. I: 2. V: 37. Georg. I: 77. I: 154. 1:  
 226. Colum. II: 11, also Varro, and all pre-Linnaean and post-  
 Linnaean authors. Tour. Éls. 415. (1694). I. R. H. 574. (1700).  
 Linn. Syst. (1735). Gen. 15. (1737), 85. (1754).  
*Avenacea* Scheuch. 4: 15. 22. *Bromus* Fuchs. Hist. 65. (1546).  
*Bromus* Dioscorides 4: 140 = *Avena fatua*.
107. *Avena sativa* Tragus, De Stirpium Hist. 653. (1552).  
 Linn. Sp. Pl. 79. (1753).  
 Leeds, Butte.
108. *Avena fatua* Linn. Sp. Pl. 80. (1753).  
 Leeds, Butte.
109. *Avena striata* Michx. Fl. Bor. Am. I: 73. (1803).  
 Devil's Lake.
110. *Avena americana* Scribn. Bull. Agrost. U. S. Dept.  
 Agr. 7, 183. (1897).
- Tribe VIII. **CHLORIDEAE** Kunth. Mem. Mus. Paris II:  
 72. (1815).
- SPARTINA* Schreb. Gen. 43. (1789).
111. *Spartina Michauxiana* Hitchc. Gray. Man. VII. 142.  
 (1908).  
*Spartina cynosuroides* Am. Auth., not Roth.  
 Leeds, Butte.
112. *Spartina gracilis* Trin. Mem. Acad. St. Petersburg. 6: 5.  
 (1840).

Leeds, Minnewaukan, Butte, York.

*SPIROCHLOE* Lunell, nom. nov. (from *σπειράν*, to twist, and *χλός*, grass, the axis of the panicle at maturity becoming elongated and spiral).

*Schedonnardus* Steud. Syn. Pl. Gram. 146. (1855). The name not thought permissible, being built on *Nardus*.

113. *Spirochloe paniculata* (Nutt.) Lunell.

*Lepturus paniculatus* Nutt. Gen. 1: 81. (1818).

*Schedonnardus paniculatus* Trelease, Branner et Coville, Rep. Geol. Surv. Ark. 1888: Part 4. 236. (1891).

Dickinson (Bergman).

*BOUTELOUA* Lag. Var. Cienc. 2: p. 4. 134. (1818).

114. *Bouteloua gracilis* (H. B. K.) Lag. Steud. Nom. Bot. ed. 2. 1: 219. (1840).

*Chondrosium gracile* H. B. K. Nov. Gen. et Sp. 1: 176. pl. 58. (1816).

*Bouteloua oligostachya* Torr. in Gray Man. 553. (1856).

*Atheropogon oligostachyum* Nutt. Gen. 1: 78. (1818).

Leeds, Dunsieith, Pleasant Lake.

115. *Bouteloua curtipendula* (Michx.) Torr. in Emory Mil. Recon. 154. (1848).

*Chloris curtipendula* Michx. Fl. Bor. Am. 1: 59. (1803).

Butte, Minot.

*BECKMANNIA* Host. Gram. Austr. 3: 5, pl. 6. (1805).

116. *Beckmannia erucaeformis* (Linn.) Host. l. c.

*Phalaris erucaeformis* Linn. Sp. Pl. 55. (1753).

Leeds, Butte.

*BULBILIS* Raf. Am. Month. Mag. 4: 190. (1819).

*Buchloe* Engelm. Trans. St. Louis Acad. 1: 432. (1859).

117. *Bulbilis dactyloides* (Nutt.) Raf.; Kuntze. Rev. Gen. P<sup>l</sup>. 763. (1891).

*Sesleria dactyloides* Nutt. Gen. 1: 65. (1818).

Logan Co. (Brenckle.)

Tribe IX. **FESTUCACEAE** Dum. Obs. Gram. Agrost. Belg. 82. (1823).

*MUNROA* Torr. Pac. R. R. Rept. 4: 158. (1856).

118. *Munroa squarrosa* (Nutt.) Torr. l. c.

*Crypsis squarrosa* Nutt. Gen. 1: 49. (1818).

Medora (Bergman).

*PHRACMITES* Dioscorides 1: 14.

119. *Phragmites communis* Trin. Fund. Agrost. 134. (1820).  
*Harnudo phragmitis* Ruellius, Comarus, Dodonaeus.  
Lake Ibsen, Dunsith.  
*EROSION* Lunell, nom. nov. (dedicated to Έρως, the love god).  
*Eragostis* Beauv. Agrost. 70. pl. 14, f. 11. (1812). The name  
to be avoided, as built on another grass name.
120. *Erosion ciliare* (All.) Lunell.  
*Eragrostis ciliaris* (All.) Link. See Hubbard, Philipp. Journ.  
Sci. Bot. 8: 159-161. (1913).  
*Eragrostis megastachya* (Koehl.) Link, Hort. Berol. 1: 187.  
1827).  
Pingree, Leeds, Dunsith, Devil's Lake.
121. *Erosion hypnoides* (Lam.) Lunell.  
*Eragrostis hypnoides* (Lam.) B. S. P., Prel. Cat. N. Y. 69. (1888)  
*Poa hypnoides* Lam. Tabl. Encycl. 1: 185. (1791).  
Walpeton (Bergman).  
*CATABROSA* Beauv. Agrost. 97 (1812).
122. *Catabrosa aquatica* (Linn.) Beauv. Agrost. 157. (1812).  
*Aira aquatica* Linn. Sp. Pl. 64. (1753).  
Butte, Pleasant Lake.  
*DALUCA* Bubani, Fl. Pyr. IV. p. 350. (1901).  
*Melica* Linn. Fl. Lapp. 36. (1737), Gen. 315. (1737), not  
*Melica* Dodonaeus, Lobilius, Caesalpinus, which is *Holcus Sorghum*  
Linn.
123. *Daluca Hallii* (Vasey) Lunell.  
*Melica Hallii* Vasey, Bot. Gaz. 6: 296. (1881).  
*Festuca Hallii* (Vasey) Piper. Contr. U. S. Nat. Herb. X.  
31. (1906).  
Butte.
- DISTICHLIS* Raf. Journ. Phys. 89: 104. (1819).
124. *Distichlis spicata* (Linn.) Greene, Bull. Cal. Acad. 2:  
115. (1887).  
*Uniola spicata* Linn. Sp. Pl. 71. (1753).  
Leeds, Devil's Lake.
- DACTYLIS* Royen Lugd. Fl. 56. (1740). Linn. Gen. 29.  
(1742). Gron. Fl. Virg. p. 135. (1743).
125. *Dactylis glomerata* Linn. Sp. Pl. 71. (1753).  
Leeds.
- PANEION* Lunell, nom. nov. (dedicated to Πάν, Pan, the

god of the shepherds, of the pastures and the woods, because all its species are valuable fodder grasses).

*Poa* was the Theophrastan and Greek name for any kind of grass, like the latin *gramen*, or for any herbaceous plant).<sup>1</sup> The name ought to be disregarded for the same reason as the words *planta* or *herba* are unfit as generic names!

*Poa* Linn. Gen. 20. (1737).

126. **Paneion aridum** (Vasey) Lunell.

*Poa arida* Vasey, Contr. U. S. Nat. Herb. 1: 270. (1893).  
York.

127. **Paneion Buckleyanum maius** (Vasey) Lunell.

*Poa Buckleyana* Nash. Bull. Torr. Club. 22: 465. (1895), var. *maior* (Vasey).

*Poa tenuifolia* Buckley, Proc. Acad. Phila. 1862: 96. (1862).  
Not A Rich. (1851), var. *maior* Vasey.

Leeds.

128. **Paneion bulbosum** (Linn.) var. **viviparum** (Koch.)  
Lunell.

*Poa bulbosa* Linn. var. *vivipara* Koch. Fl. Syn. Germ. et Helvet. p. 802. (1837).

*Dickinson* (Cl. Waldron).

129. **Paneion compressum** (Linn.) Lunell.

*Poa compressa* Linn. Sp. Pl. 69. (1753).

Dunsieth.

130. **Paneion glaucum** (Vahl.) Lunell.

*Poa glauca* Vahl. Fl. Dan. pl. 964. (1790).

Dunsieth.

131. **Paneion interius** (Rydberg) Lunell.

*Poa interior* Rydb. Bull. Torr. Club. 32: 604. (1905).

Rolette Co.: Nansen.

132. **Paneion longiligulum** (Scribn. et Williams) Lunell.

*Poa longiligula* Scribn. et Williams, Circ. U. S. Dept. Agric. Div. Agrost. 9: 3. (1899).

Pleasant Lake.

133. **Paneion nemorale** (Linn.) Lunell.

*Poa nemoralis* Linn. Sp. Pl. 69. (1753).

Leeds, York, Pleasant Lake, Devil's Lake, Dunsieth, Turtle Mountains.

134. **Paneion pratense** (Linn.) Lunell.

<sup>1</sup> Cfr. "gras" in the norwegian-american brogue of to-day.



- Poa pratensis* Linn. Sp. Pl. 67. (1753).  
 Leeds, Devil's Lake.
135. *Paneion pratericolum* (Rydb. et Nash) Lunell.  
*Poa pratericola* Rydb. et Nash, Mem. N. Y. Bot. Gard. 1:  
 51. (1900).  
 Butte, Towner.
136. *Paneion Sandbergii* (Vasey) Lunell.  
*Poa Sandbergii* Vasey, in Scribn. Bull. Torr. Bot. Club 10:  
 276. (1883).  
 Leeds.
137. *Paneion triflorum* (Gilib.) Lunell.  
*Poa triflora* Gilib. Exercit. 531. (1782).  
*Poa serotina* Ehrh. Beitr. 6: 83. (1791).  
*Poa flava* Am. Authors, not Linn.  
 Leeds.
- SCOLOCHLOA* Link. Hort. Berol. 1: 136. (1827).  
 138. *Scolochloa festucacea* (Willd.) Link. l. c. 137.  
*Arundo festucacea* Willd. Enum. 1: 126. (1809).  
 Leeds, Lake Ibsen. The sterile plant covers square miles of  
 dried up lake bottoms in the state!
- GLYCERIA* R. Br. Prodr. Fl. Nov. Holl. 1: 179. (1810).  
*Panicularia* Fabricius, Enum. Hort. Helmst. 373. (1763).  
 Name bad, if derived from *Panicum* (dim. *Panicula*, and then  
*Panicularia*; or if built on *panicula*, panicle, just as objectionable,  
 as if *spica* or *capitulum* or *racemus* were used as material for  
 genus names.
139. *Glyceria nervata* (Willd.) Trin. Mem. Acad. St. Petersburg.  
 1: 365. (1831).  
*Poa nervata* Willd. Sp. Pl. 1: 389. (1798).  
*Panicularia nervata* Kuntze Rev. Gen. Pl. 783. (1891).  
 Butte, Pleasant Lake.
140. *Glyceria nervata rigida* (Nash.) Lunell.  
*Panicularia nervata rigida* Nash. Mem. N. Y. Bot. Gard. 1:  
 54. (1900).  
 Butte.
141. *Glyceria americana* (Torr.) Lunell.  
*Poa aquatica* var. *americana* Torr. Fl. U. S. 1: 108. (1824).  
*Glyceria grandis* S. Wats. in Gray Man. VI. 667. (1890).  
*Panicularia americana* McM. Met. Minn. 81. (1892).  
 Leeds, Butte, Pleasant Lake.

142. *Glyceria borealis* (Nash.) Batchelder.

*Panicularia borealis* Nash in Bull. Torr. Bot. Club 24: 348 (1897).

Paradise (Bell); Butte (extinct).

*PUCCINELLIA* Parl. Fl. Ital. 1: 366. (1848).

143. *Puccinellia maritima* (Huds.) Parl. l. c. 370.

*Poa maritima* Huds. Fl. Angl. 35. (1762).

*Glyceria maritima* M., et K. Deutsch. Fl. 1: 588. (1823).

Devil's Lake.

144. *Puccinellia airoides* (Nutt.) Wats., et Coult. in A. Gray, Man. VI: 668. (1890).

*Poa airoides* Nutt. Gen. 1: 68. (1818).

Leeds, York, Devil's Lake.

*GNOMONIA* (gr. γρόσιον, alluding to fescue, in the English name of the genus) Lunell, nom. nov. *Festuca*, first applied by Dodonaeus, Herb. 321. (1551) = *Bromus secalinus*.

*Festucaria* Heister, Syst. 45. (1737) is founded on *Festuca*, and for this reason not much of a name, and undesirable.

*Festuca* Linn. Syst. (1735), Gen. 15, (1737).

145. *Gnomonia octoflora* (Walt.) Lunell.

*Festuca octoflora* Walt. Fl. Car. 81. (1788).

Dickinson (Bergman).

146. *Gnomonia ovina* (Linn.) Lunell.

*Festuca ovina* Linn. Sp. Pl. 73. (1753).

Butte, Towner.

147. *Gnomonia ovina supina* (Hack.) Lunell.

*Festuca ovina supina* Hack.

Butte.

148. *Gnomonia elatior* (Linn.) Lunell.

*Festuca elatior* Linn. Sp. Pl. 75. (1753).

Wahpeton (Bell).

149. *Gnomonia nutans* (Willd.) Lunell.

*Festuca nutans* (Willd. Enum. I: 116. (1809).

Valley City (Bergman).

150. *Gnomonia viridula* (Vasey) Lunell.

*Festuca viridula* Vasey, Ill. N. A. Grasses t. 93. (1893), also Contr. U. S. Nat. Herb. 1: 279. Calif.

Dunsieth (only locality known east of Idaho).

*FORASACCUS* Bubani, Fl. Pyr. IV. p. 380. (1901).

- Bromus* Sibth., Matthioli, Dodoneaus, Lobelius, Caesalpinus,  
C. Bauhin, etc. = *Avena fatua*.

*Bromus* Linn. synonym to *Avena*.

*Avenaria* Heister, Syst. 12. (1743), founded on *Avena*.

151. ***Forasaccus arvensis*** (Linn.) Bubani l. c. 385.

*Bromus arvensis* Linn. Sp. Pl. 77, (1753).

Fargo (Bergman).

152. ***Forasaccus ciliatus*** (Linn.)

*Bromus ciliatus* Linn. Sp. Pl. 76. (1753).

Dokkens Pond; Peninsula of Lake Ibsen.

153. ***Forasaccus ciliatus laeviglumis***; (Scribn.) Lunell.

*Bromus ciliatus laeviglumis* Scribn.

Leeds.

154. ***Forasaccus purgans*** (Linn.) Lunell.

*Bromus purgans* Linn. Sp. Pl. 76. (1753).

Minot.

155. ***Forasaccus breviaristatus*** (Hook.) Lunell.

*Bromus breviaristatus* Buckl. Proc. Acad. Phila. 1862: 98. (1862)

*Ceratochloa breviaristata* Hook. Fl. Bor. Am. 2: 253. (1840).

Bottineau.

156. ***Forasaccus latiglumis*** (Hitchc.) Lunell.

*Bromus latiglumis* Hitchc, Rhodora VIII: 211. (1906).

Towner.

157. ***Forasaccus marginatus*** (Nees.) Lunell.

*Bromus marginatus* Nees in Steud. Syn. Pl. Gram. 322. (1824).

Devils Lake, Dunsieith.

158. ***Forasaccus inermis*** (Leyss.) Lunell.

*Bromus inermis* Leyss. Fl. Hal. 16. (1761).

Leeds.

159. ***Forasaccus Pumpellianus*** (Scribn.) Lunell.

*Bromus Pumpellianus* Scribn. in Bull Torr. Bot. Club. 15:

9. (1888).

Leeds, York.

Tribe X. **HORDEAE** Lindl. Veg. Kingd. 116. (1847).

**LOLIUM** Vergilius Ecl. V: 37, Georg. I: 154, also Plinius 18:

46. Linn. Syst. (1733), Gen. 16. (1737), 36. (1755).

160. ***Lolium infelix*** Vergilius l. c. both places.

*Lolium temulentum* Linn. Sp. Pl. 83. (1753).

Dickinson (C. Waldron).

**ZEIA**, *Zea* Dioscorides 4: 23 = *Triticum Spelta* Linn.

*Agropyron* J. Gaertn. Nov. Comm. Petrop. 14: Part 1. 539. (1770).

161. *Zeia Spelta* (Linn.) Lunell.

*Triticum Spelta* Linn. Sp. Pl. 423. (1753).

Occasionally escaped from cultivation. Butte.

162. *Zeia vulgaris aestiva* (Linn.) Lunell.

*Triticum vulgare aestivum* Linn.

An occasional escape. Butte.

163. *Zeia biflora* (Brign.) Lunell.

*Agropyron biflorum* (Brign.) Roem. et Schult Syst. II. 760. (1817).

Towner.

164. *Zeia canina* (Linn.) Lunell.

*Agropyron caninum* (Linn.) R. S. Syst. 1. c. 756.

*Triticum caninum* Linn. Sp. Pl. 86. (1753).

Towner, Pleasant Lake, Dunsieith.

165. *Zeia cristata* (J. Gaertn.) Lunell.

*Agropyron cristatum* J. Gaertn. 1. c. 540.

Dickinson (C. Waldron).

166. *Zeia dasystachya* (Hook.) Lunell.

*Agropyron dasystachyum* (Hook.) Vasey, Spec. Rept. U. S. Dept. Agric. 63: 45. (1883).

Dickinson (C. Waldron).

167. *Zeia glauca* (Desf.) Lunell.

*Agropyron glaucum* (Desf.) R. et S. Syst. 2: 752. (1817).

*Triticum glaucum* Desf. Scribn. Mem. Torr. Bot. Club 5:

57. (1894).

Leeds.

168. *Zeia mollis* (Scribn. et Sm.) Lunell.

*Agropyron molle* (S. et S.) Rydb. Mem. N. Y. Bot. Gard. Vol. I: 65. (1900).

Medora (Bergman).

169. *Zeia occidentalis* (Scribn.) Lunell.

*Agropyron occidentale* Scribn. U. S. Dept. Agric. Div. Agrost. Cir. 27: 9. (1900).

Towner.

170. *Zeia pseudorepens* (Scribn. et Sm.) Lunell.

*Agropyron pseudorepens* S. et S. U. S. Dept. Agric. Div. Agrost. Bull. 4: 34. (1897).

Devil's Lake.

171. *Zeia repens* (Linn.) Lunell.  
*Agropyron repens* (Linn.) Beauv. Agrost. 146. (1812).  
*Triticum repens* Linn. Sp. Pl. 86. (1753).  
 Leeds, Pleasant Lake.
172. *Zeia Richardsonii* (Schrud.) Lunell.  
*Agropyron Richardsonii* Schrad. Linnaea XII: 467. (1838).  
 Leeds, Butte, Towner.
173. *Zeia riparia* (Scribn. Sm.) Lunell.  
*Agropyron riparium* S. S. Bull. U. S. Dept. Agric. Div. Agrost.  
 4: 35. (1897).  
 Dunsieith.
174. *Zeia Smithii* (Rydb.) Lunell.  
*Agropyron Smithii* Rydb. Mem. N. Y. Bot. Gard. Vol. 1:  
 61 and 64. (1900).  
 Leeds, Dunsieith.
175. *Zeia spicata* (Pursh) Lunell.  
*Agropyron spicatum* (Pursh) Rydb. Mem. N. Y. Bot. Gard.  
 I: 61. (1900).  
 Medora (Bergman).
176. *Zeia tenera* (Vasey) Lunell.  
*Agropyron tenerum* Vasey, Bot. Gaz. 10: 258. (1885).  
 Leeds, Butte, Devils Lake, Towner; Kulm (Brenckle),  
 SECALE.
177. *Secale cereale* Linn.  
 Subspontaneous on railroad banks. Towner, Pleasant Lake.  
*HORDEUM* Vergilius Ecl. V: 36. Georg. I: 317, Cato 35,  
 Plinius 18: 7, Colum. II: 9. *Krithe leuce* Homeros, Odys. 3: 41,  
 Iliad I: 196, Athem, Deipuf I: 61. *Krithe* Theophr. Hist. 2: 3.  
*Bosmoron* Strabo? (this latter perhaps *Mais vulgaris*!), *Kri he*  
 Achilleis, Hippokrates Morb. 3: 496, also *Hordeum* of all older  
 and later writers Tour. Linn. before and after: Linn. Syst. (1735),  
 Gen. 16. (1757), 37 (1755); Tour. Éls. 414. (1694) I. R. H. 513.  
 (1700).
178. *Hordeum jubatum* Linn. Sp. Pl. 85. (1753).  
 Leeds.
179. *Hordeum vulgare* Linn. Sp. Pl. 85. (1753).  
 Subspontaneous. Butte.
- TERRELLIA* (latinizing from its English name, Terrell-  
 grass) Lunell, nom. nov.  
*Elymus* is according to Adanson, Fam. 2. 606. (1763) =

*Litospelos* which name was applied by Diosc. to *Triticum sylvestre* and *Aegilops*. Acc. to Caesalpinus *Elymus* refers to *Panicum vulgare* which was called *Elymum* and *Meline* by Theophr. *Elymus* Linn. Sp. Pl. 83. (1753). Name very doubtful.

180. **Terrellia striata** (Willd.) Lunell.

*Elymus striatus* Willd. Sp. Pl. I: 470, (1797).

Devil's Lake.

181. **Terrellia virginica** (Linn.) Lunell.

*Elymus virginicus* Linn. Sp. Pl. 84. (1753).

Peninsula of Lake Ibsen.

182. **Terrellia virginica submutica** (Hook.) Lunell.

*Elymus virginicus submuticus* Hook. Fl. Bor. Am. 2: 255. (1840).

Minot, Towner.

183. **Terrellia canadensis** (Linn.) Lunell.

*Elymus canadensis* Linn. Sp. Pl. 83. (1753).

Devil's Lake, Turtle Mountains, Leeds, Towner, Pleasant Lake; Kulm (Brenckle). Extremely variable.

184. **Terrellia canadensis glaucifolia** (Willd.) Lunell.

*Elymus canadensis glaucifolius* (Willd.) Torr. Fl. U. S. I:

137. (1824).

*Elymus glaucifolius* Willd. Enum. I: 131. (1809).

Fargo (Bergman).

185. **Terrellia glauca** (Buckl.) Lunell.

*Elymus glaucus* Buckley, Proc. Acad. Phila. 1862: 99. (1862).

Butte, Turtle Mountains.

186. **Terrellia Macounii** (Vasey) Lunell.

*Elymus Macounii* Vasey, Bull. Torr. Club 13: 119. (1886).

Towner, Peninsula of Lake Ibsen.

187. **Terrellia diversiglumis** (Scribn. et Ball) Lunell.

*Elymus diversiglumis* Scribn. Ball. et Bull. U. S. Dept. Agr.

Agrost. 24. 48. f. 22. (1901).

Walhalla (Bergman).

**GYMNOSTICHUM** Schreb. Besch. Gras. 2. 127. pl. 47. (1810).

*Asprella* Willd. Enum. 132. (1809). Not Schreb. (1789).

*Hystrix* Moench. Mteh. 294. (1794). This is the Greek word for hedgehog, and is an improper name for a plant!

188. **Gymnostichum patulum** (Moench.) Lunell.

*Hystrix patula* Moench l. c. Devil's Lake.

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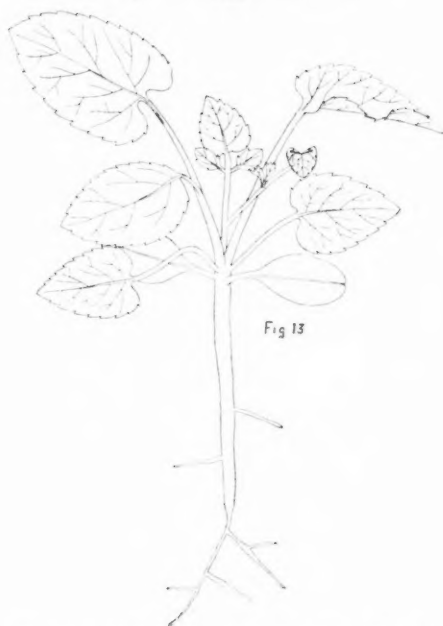
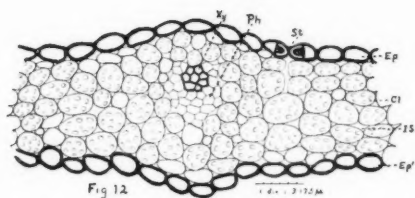
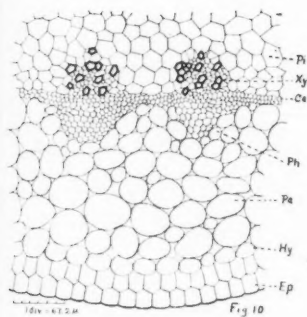
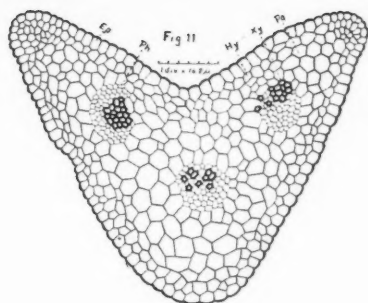
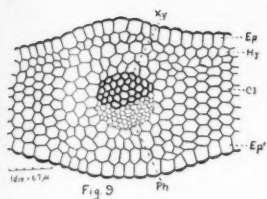
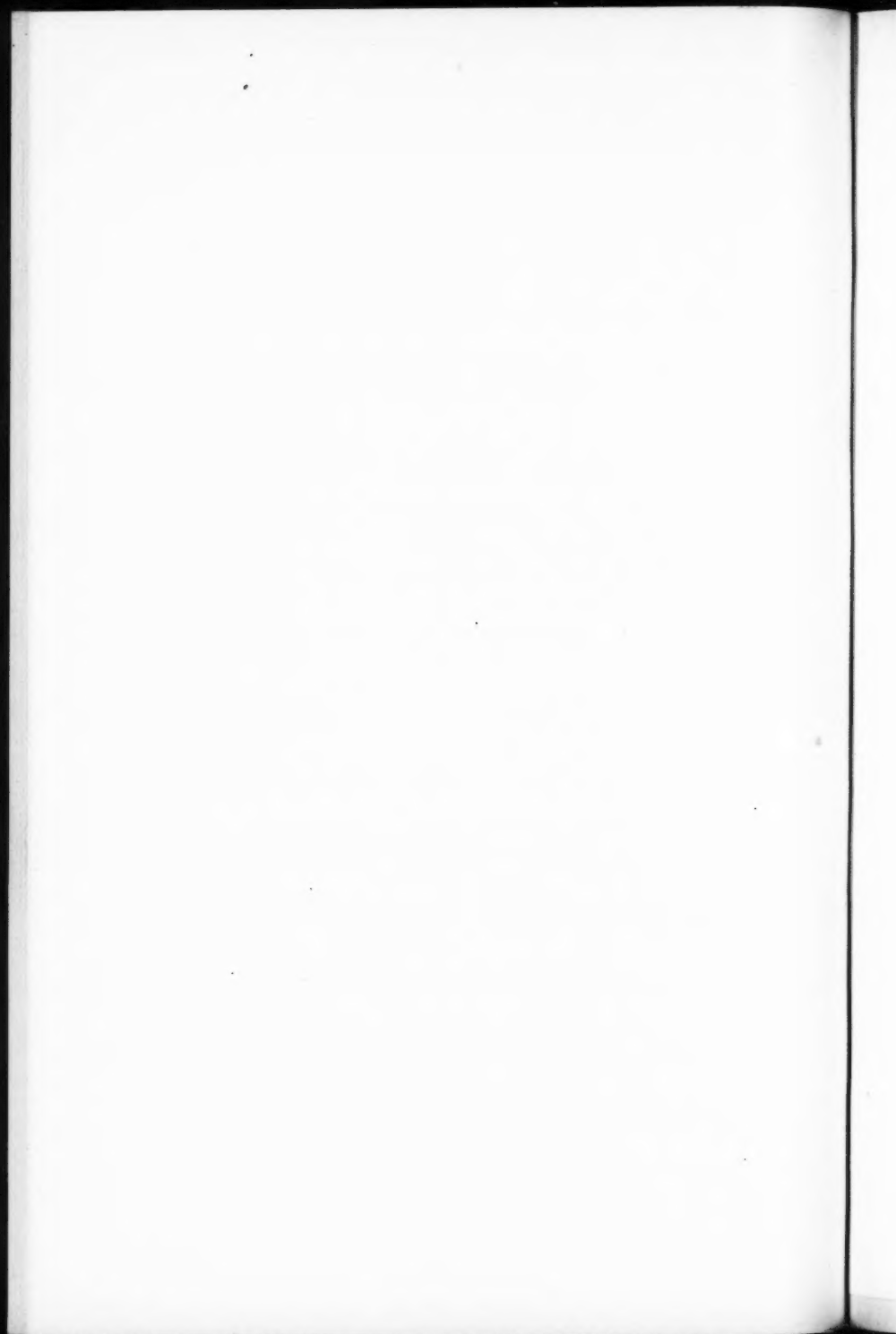
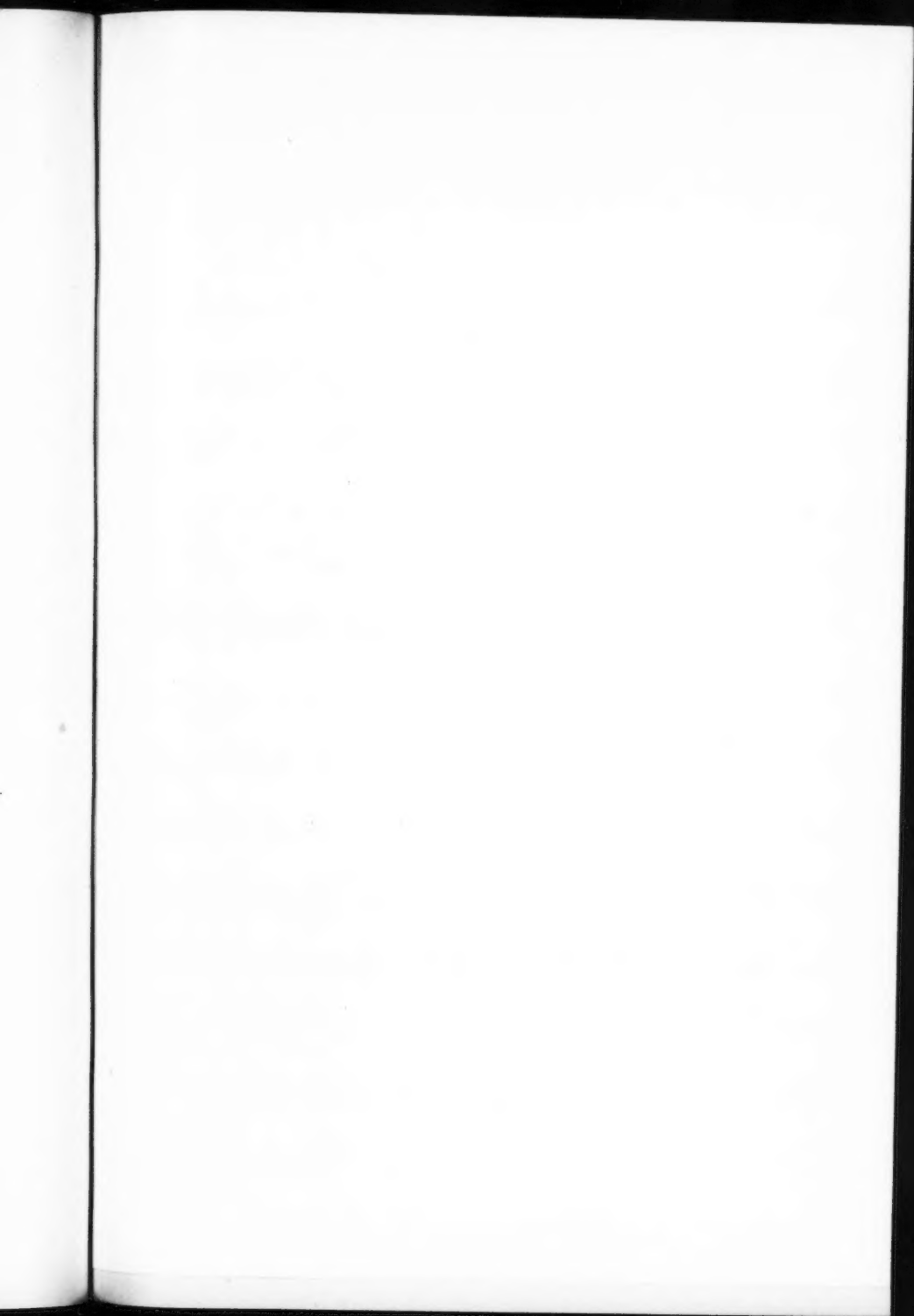
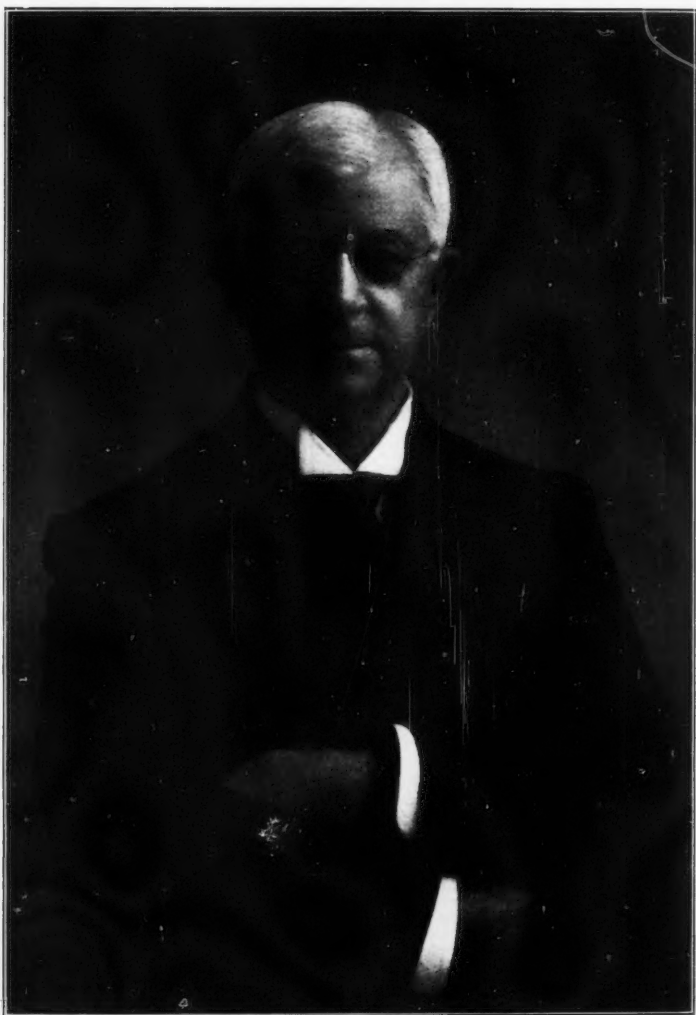


PLATE XII. LYNCH ON SAMBUCUS PUBENS VAR. XANTHOCARPA.









**Edward Lee Greene**

BORN, HOPKINTON, R. I., AUGUST 20, 1843  
DIED, WASHINGTON, D. C., NOVEMBER 10, 1915

## IN MEMORIAM.

Botanists and scientific men generally in this country and abroad will realize that in the passing away of Dr. Edward Lee Greene, the world has lost one of its ablest scholars and a modest type of perfect gentlemen. His work for thorough, exact, remarkable insight into questions trying and difficult was even more respectfully acknowledged and praised in the old world than at home in America. He was one of those gentle unselfish kindly men that allow no obstacle to stand in the way towards the attainment of truth in every line of endeavor, scientific or religious. Concerning the assistance which in a hidden way he gave to the needy with the modest means at his hand in pecuniary matters, we have heard from all sides, and that too with out any hope or expectation of return. His kindness in spending his precious time helping others in things scientific has been felt by all who have had the pleasure of being associated with him but a short time. His particular form of charity was assisting others too learn, or educate themselves.

Scientific research was so thoroughly a passion with him that no mere matters of earthly gain or temporal expedience could tempt him from seeking always the higher things. In fact, this caption, the motto of his bookmark, has been the guiding ideal of his whole long useful and unselfish career: "*Altiora petivimus*," "We have striven for the higher things." None but the highest and most difficult problems could tempt his attention.

When the botany of the Eastern United States began to languish after Asa Gray, Engellman and Torrey had passed away, Dr. Greene fresh from fields of the West, showed the students of the Atlantic Flora that many a new and unknown species still blushed unseen at their very feet. When he began to publish new plants from a region hitherto considered to be well known, botanists were at first incredulous, but finally felt that they had been lulled to inactivity. When the better part of his life had been spent in another field of work, we owe it to him to have aroused us in the East to zeal and activity in studying the unknown wonders of our botanic region. Not a few journals of natural history came into being or were encouraged to higher and better work by his coming among us.

Dr. Greene was born in Hopkinton, R. I., Aug. 20, 1843.

When he was still a boy his parents moved West and settled along the Sangamon River in Illinois. He served in the Civil War as private and on the campaign, collected plants and determined them in odd moments from a copy of Wood's botany which he carried in his knapsack. After the war he received the degree Ph. B. at Albion, Wisconsin in 1866. Thenceforth a longing to botanize in other fields drew him to Colorado in 1870. Here he became an Episcopal minister, and he asked for charges in country places the better to devote his spare time to his favorite science. He botanized through Wyoming, New Mexico, Arizona, and California. He was instructor, or professor, in the University of California from 1885 to 1895, when he came East to take the chair of Botany in the Catholic University of America at Washington, D. C. In 1894 he received the doctorate from the University of Notre Dame. In May, 1904, he left the Catholic University and became honorary associate in Botany in the Smithsonian Institute, where he had been occupied in research in systematic and historical botany until in the fall of 1914 he arranged to come to Notre Dame University to take charge of the graduate course in botany. His numerous collections and library were left to the University. Dr. Greene died after a rather prolonged wasting and painful stomach trouble at Providence Hospital, Washington, D. C., on Nov. 10, 1915. He had gone to Washington to meet again his old friends and associates and finish the remaining chapters of his second volume of "Landmarks."

Dr. Greene will be remembered by all who knew him long or met him but casually as a type of gentlemanly kindness and modesty that betokens deep learning. Little, however, would the ordinary observer suspect his profound erudition except by long association. Kind and gentle with all he could be unrelenting in attacking sham or presumptuous ignorance when he could use all the power of art and elegant expression in sustaining what he considered truth. There are some who were not in sympathy with his ideas of plant divisions, but the botanists with keen sense of analysis and deep perception of differences, in contradistinction to the dilettante always respected his views. There are those who did not share his opinions on priority of nomenclature, but none that know the intricacies of these questions will hesitate to admire or fear his wonderful erudition. As a historical botanist he ranks alone in America.

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